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Physico-chemical characterisation of material fractions in household waste: overview of data in literature

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Abstract

State-of-the-art environmental assessment of waste management systems rely on data for the physico-chemical composition of individual material fractions comprising the waste in question. To derive the necessary inventory data for different scopes and systems, literature data from different sources and backgrounds are consulted and combined. This study provides an overview of physico-chemical waste characterisation data for individual waste material fractions available in literature and thereby aims to support the selection of data fitting to a specific scope and the selection of uncertainty ranges related to the data selection from literature. Overall, 97 publications were reviewed with respect to employed characterisation method, regional origin of the waste, number of investigated parameters and material fractions and other qualitative aspects. Descriptive statistical analysis of the reported physico-chemical waste composition data was performed to derive value ranges and data distributions for element concentrations (e.g. Cd content) and physical parameters (e.g. heating value). Based on 11,886 individual data entries, median values and percentiles for 47 parameters in 11 individual waste fractions are presented. Exceptional values and publications are identified and discussed. Detailed datasets are attached to this study, allowing further analysis and new applications of the data.

1. Introduction

State-of-the-art environmental assessment of waste management systems rely on data for the physico-chemical composition of individual material fractions comprising the specific waste (e.g. Laurent et al., 2014; Astrup et al., 2015). Emissions of metals from thermal treatment of waste depend on the metal content of the waste materials received at the waste incinerator (e.g. Brunner and Rechberger, 2014; Astrup et al., 2011; Morf et al., 2000). The composition of compost after aerobic degradation of organic waste is affected by the purity of the input organic waste to the composting facility (Andersen et al., 2010). Similarly, unwanted substances in waste paper collected for recycling may affect the recyclability of the paper (e.g. Pivnenko et al., 2015). Decision support tools like life cycle assessments (LCA), as well as substance flow analysis (SFA) and material flow analysis (MFA), apply waste characterisation data as input for modelling of waste management systems and individual waste technologies, for example, to identify emission hotspots, dissipation of valuable resources, and to assess the environmental consequences of potential new waste management initiatives, e.g. new source-segregation schemes affecting the material composition of existing waste incinerators, additional pre-treatment of organic waste fractions prior to composting, or isolation and removal of potential contaminated material fractions from waste flows. Without data for the physico-chemical composition of these individual material fractions, the environmental consequences of such management initiatives cannot be systematically estimated and evaluated, and emissions from the waste treatment processes cannot be tracked back to individual waste material fractions (Astrup, 2011; Manfredi et al., 2010, 2011; Rotter, 2004).

Due to the inherent heterogeneity of waste materials as well as temporal and spatial variability, representative sampling and analysis of waste samples is challenging, labour intensive and costly. Consequently, life cycle assessment of waste management technologies and systems are most often based on literature waste characterisation data (e.g. Aye and Widjaya, 2006; Cherubini et al., 2008; Fruergaard and Astrup, 2011; Arena and Di Gregorio, 2014). While selection of these modelling input data may significantly affect the outcome of such studies (e.g. Slagstad and Brattebø, 2013; Clavreul et al., 2014; Laurent et al., 2014), very little attention is devoted to the selection of data and the type of literature sources (e.g. focus and origin of the studies providing the waste characterisation data, sampling and analytical methods applied, data coverage, etc.). As such, little guidance is available for LCA practitioners for selection of waste characterisation data and/or for evaluation of case-specific data in the perspective of data available in literature. An overview of existing characterisation data quantifying data variability for different physico-chemical parameters in individual waste material fractions, and linking critical values to specific publications, sub-fractions, geographical scopes and characterisation methods is important to support LCA practitioners in making an informed choice for their inventory data. Such an overview has not been provided previously.

A variety of waste characterisation methods have been developed, however, no international consensus has been achieved so far (Dahlén and Lagerkvist, 2008). From a more generic perspective, Brunner and Ernst (1986) defined three approaches for waste characterisation: i) direct waste analysis, ii) waste product analysis, iii) market product analysis. Direct waste analysis examines individual samples of waste materials by chemical analysis. Waste product analysis (also referred to as indirect waste analysis) combines chemical analysis of output materials from waste treatment facilities (e.g. incineration residues, compost or mechanically sorted waste fractions) with mass and substance balance calculations to determine the chemical composition of the input material. A key advantage of waste product analysis over direct analysis is the minimisation of uncertainties associated with sampling as samples of residues from incineration represent larger waste quantities entering the incinerator (e.g. Brunner and Ernst, 1986; Astrup et al., 2011). On the other hand, waste product analysis may provide limited information about individual material fractions within waste flows (i.e. waste product analysis involving waste incinerators may only provide data for the combined waste input flow, rather than the individual materials in the waste), while direct waste analysis may address the specific material fractions within mixed waste flows (e.g. household waste). In both cases, however, high quality characterisation data require considerable attention to sampling and sample handling (e.g. Gy, 1998; Morf and Brunner, 1998; Petersen et al., 2004). Market product analysis estimates the waste composition based on national statistics on production and consumption of goods (Brunner and Ernst; 1986) and is classically used to quantify material and substance flows (MFA/SFA) within a country. As we aimed at directly reported element concentrations and using the later explained search criteria no studies using this approach could be identified, market product analysis is not further addressed in this paper.

Both direct and indirect waste analysis requires considerable efforts for capturing spatial and temporal variation in the physico-chemical properties of waste materials. This may result in limited availability of waste characterisation data suitable for specific assessment purposes. The importance for LCA studies of applying appropriate waste composition data reflecting the spatial and temporal scope of the assessment has been pointed out in several cases (e.g. Clavreul et al., 2012; Fruergaard and Astrup, 2011). However, in a review of LCA studies of waste-to-energy technologies, Astrup et al. (2015) reported that only 44% of studies in literature provided information about the chemical composition of the addressed waste (and only 60% of these specified the origin of the data). Despite the potential challenges related to data quality, data coverage, characterisation approaches, etc., state-of-the-art waste LCA modelling most often involves selection and combination of various data sources for establishment of the needed input data (e.g. Fruergaard and Astrup, 2011). Potentially, this may involve a mixture of datasets from different publications based on a variety of waste characterisation methods as well as varying temporal and regional scopes (e.g. Aye and Widjaya, 2006; Cherubini et al. 2008; Arena and Di Gregorio, 2014). To properly address uncertainties in LCA modelling of waste technologies, a basis for identifying appropriate uncertainty ranges reflecting the choice of physico-chemical waste composition data is needed. A quantitative overview of value ranges and variability of waste characterisation data in literature, including the variations due to involved methods, geographical scopes, waste types, and parameters, is fundamental in this context.

The overall aim of the paper is to provide an overview of available data on the physical and chemical composition of individual waste material fractions in literature. This includes the following, more specific objectives: i) systematically collecting relevant waste characterisation data in literature for materials in household waste, or materials very likely to be found in household waste, ii) evaluating key aspects of the involved literature (e.g. region, sampling point, type of waste materials, characterisation method, analytical method), and iii) quantifying value ranges and data distributions for selected parameters (e.g. energy, nutrient and heavy metal contents) for individual waste material fractions based on the collected data. The provided value ranges include all types of uncertainty and variability related to acquisition of the waste characterisation data in literature (i.e. temporal and spatial variation, as well as uncertainties related to the waste characterisation approach, sampling and chemical analysis). The value ranges thereby represent full error margins associated with the "blind" selection of data from literature. Finally, gaps in existing literature and data availability for individual regions, the included parameters and waste material fractions are identified.

2. Methods

2.1. Literature selection

Literature indexed and accessible through online search platforms (e.g. Web of Science, Google Scholar and ScienceDirect; a list of keywords is provided in Table 1A in Appendix A) was included. Only literature published in English, German, Dutch, French and Italian was assessed. Publications were selected according to the following criteria:

I. the publication was published between 1990 and 2014;

II. the publication addressed the characterisation, management or treatment of municipal solid waste or waste materials that are very likely to be found in household waste and waste with comparable properties;

III. the publication presented physico-chemical data for heating value, ash content and/or the elemental composition of distinct waste materials or mixed waste fractions from household waste or comparable sources.

To ensure that the results would be relevant for a broad range of waste management assessment scenarios, characterisation data on mechanically processed waste were excluded (e.g. plastics sorted in a MRF from co-mingled fraction). For the same reason, publications investigating "artificial waste samples" (i.e. non-waste materials or mixtures of non-waste materials) were also excluded. Only literature published after 1990 was included to ensure relevance for current and near-future waste compositions. The reviewed publications included peer-reviewed journal articles, accessible theses, and online available reports from governmental institutions and other organizations. When the presented data originated from other articles, reports or theses, the primary source was identified and, if accessible, added to the collection instead of the secondary source. When the primary source could not be accessed, the secondary data source was used. If the provided characterisation data were published only in figures, the original data were requested from the authors. If the authors could not be contacted or did not reply, the values were estimated based on the graphics via digital measuring tools.

2.2. Data extraction from literature

The waste materials addressed in literature were categorised as one of 11 pre-defined waste material fractions: mixed organic waste, food waste, gardening waste, paper and cardboard, composites, plastics, combustibles, metal, glass, inert or mixed waste. Hazardous and electronic waste fractions were excluded from the scope of the study. A more detailed description of the 11 defined waste material fractions is provided in Table A2 in Appendix A.

Data were considered single database entries when the reported values represented individual samples in time (e.g. season or any other occasion) and location (e.g. treatment facility, municipality orsocio-economic factors in the collection area). The waste characterisation data found in literature were reported in several ways: i) single values, ii) value ranges, iii) median values with a percentile, or iv) mean values with a variation (e.g. 5±0.2). To allow comparison, database entries were converted into individual data points using the following approach: i) single values were included as individual data points; ii) value ranges or repeated measurements of the same material sample were included as two data points equivalent to the higher and lower end of the range; iii) medians with percentiles were included as three data points: the median and reported percentiles as one lower and one upper value; iv) mean values with a variation (regardless of probability distribution or level of confidence) were included as three data points: mean, mean minus the variation and mean plus the variation. The abovementioned approach thereby attributed more "weight" to data from studies reporting median/mean values with uncertainty ranges as opposed to studies reporting only single values. This was done tacitly acknowledging that studies providing median/mean values with ranges also offered more "information" than associated with single values. Negative values were discarded (as negative concentrations do not exist); e.g. if a mean value minus the variation resulted in a negative value.

2.3. Data evaluation

While the collected literature data represented a wide variety of sources and approaches, the intention was not a priori to discard specific data types or analysis approaches, but rather to provide an overview of the full range of data available. This approach tacitly assumed that published research may provide useful information, regardless the "quality" of the reporting and the specific experimental methods applied. Based on the set of database entries collected from literature, median concentrations and 10%, 25%, 75% and 90% percentiles were calculated for the available physico-chemical parameters and waste material fractions. The difference between the 25% percentile (lower quartile) and the 75% percentile (upper quartile) is called the “interquartile range”. Values outside the interval between the upper quartile, plus the interquartile range multiplied by a factor of 1.5 and the lower quartile minus the interquartile range multiplied by a factor of 1.5, were considered as outliers relative to the remaining literature data.

If results below the detection limit were reported as semi-quantitative information, i.e. if the exact value of the detection limit was provided, this value was included as a database entry. If data were reported on a wet basis, the dry-based equivalent was calculated using the reported moisture contents of the materials. Data on ash contents were derived from reported data for the volatile solid content (VS), following the assumption that the sum of ash contents and volatile solid contents add up to 100%.

3. Results and Discussion

3.1. Literature overview

3.1.1. Number and type of publications

Overall, 101 publications were identified as relevant according to the selection criteria. Of these, only 97 were suitable for further evaluation (see Table A3 in Appendix A for a complete list of publications): in one publication (LfU, 2002) compositional values could not be extracted because of the quality of the presented figures, while three other publications (Morf et al., 2000; Riber, 2005; Øygard et al., 2004) only provided data based on wet weight of the waste materials, without reporting any moisture content. As the comparison of dry- and wet weight-based values is not meaningful and most data were reported per dry weight, data from these three publications were excluded from further evaluation. Overall, the amount of data based on wet weight corresponded to only 0.5% of all collected database entries. While many publications (19%) did not explicitly state whether the presented values were based on dry or wet material weight, studies where the data appeared to be based on dry weight were nevertheless included - despite the risk of including some wet-based values. The following results and discussion address the 97 publications from which data could be extracted and included in the evaluation.

3.1.2. Types of publications and geographical origin

The selected 97 publications comprised 65 articles published in ISI journals, 12 reports, nine articles in other journals or conference proceedings, five books, four PhD theses and two Bachelor theses. About half of the selected publications were published after 2006. English was the primary language (83 publications), but six publications in German, four in Italian, three in French and one in Dutch were also identified. Overall 11,886 database entries were collected. The majority of waste characterisation data were obtained for European waste. Overall, 42% of the publications and 58% of the database entries described waste from Europe (Figure 1).

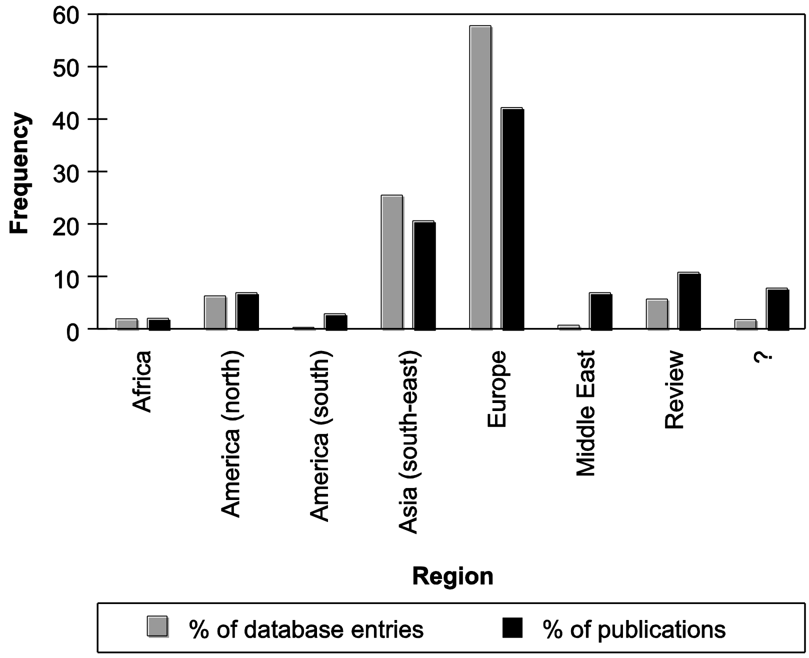

Figure 1: Data availability per region based on 97 publications containing a total of 11,886 database entries

Within Europe, most data were found for central European waste[1] (53%) and the least for southern European waste[2] (11%). Waste characterisation data from northern Europe[3], including Greenland, comprised 37% of the European data. The second largest amount of publications (20%) and database entries (25%) was found for waste from Asia. Very few publications and data were found for waste in South America (three publications) or the Middle-East, including India (four publications). Eleven publications reported reviewed data that could not be associated with a specific region, and eight publications did not report the regional origin of the investigated waste materials at all. Overall, the countries for which most characterisation data were found were China, Denmark and Germany, contributing with 25%, 18% and 9% of all database entries, respectively. Notable publications from China were: Zhang et al. (2008) and Zhou et al. (2014), the former published characterisation data only in figures but nevertheless provided an extensive dataset – upon request – describing the heavy metal contents for monthly sampled waste fractions. Zhou et al. (2014) provided a comprehensive review of waste characterisation data from publications on Chinese waste (although we suspect that some of these reviewed publications published in Chinese included simulated waste, any definitive conclusions were not possible based on the available information). Although the overall amount of data

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[1] Central Europe: Austria, Czech Republic, France, Germany, Netherlands, Switzerland, United Kingdom

[2] Southern Europe: Greece, Italy, Spain

[3] Northern Europe: Denmark, Finland, Greenland, Norway, Sweden

found appears to be extensive when subdividing the datasets from every country by physico-chemical parameters and waste material fraction clear limitations for multifactorial statistical data analysis become obvious due to data paucity as presented for the example of Cd in Table 1.

Table 1: Collected database entries for the element Cd by waste material fraction and region. Similar information for all parameters found is provided in Appendix A (Tables A6-12.

Waste Fraction	Europe	Asia	America-north	Africa	America-south	Middle East	Review	?
Mixed organics	32	2					3	1
Food waste	47	48	3					
Gardening waste	17		2					
Paper and cardboard	36	24	6				3	3
Composites	10							1
Plastic	35	24	5				5	10
Combustibles	59	48	5				11	5
Metal	30	24	5				1	1
Glass	15	25	1				1	1
Inert	17	25	1				2	1
Mix	31	25		15		6	2	1

As described more in detail in chapter 3.1.5, Cd is the parameter we found most data for. While for each fraction a substantial number of database entries was collected, many data gaps appear when sorting the data by an additional factor, such as e.g. macro-regions. Thus, a consistent statistical comparison of physico-chemical properties in individual waste fractions by region or country is not possible based on the current database. More detailed information on the regional data availability for every parameters and material combination is provided in Appendix A (Tables A6-12).

3.1.3. Data presentation and focus of studies

In 53 out of 97 of the reviewed publications, the characterisation data were presented in the results section of the study, in 16 publications in the methods section, in three publications in the introduction and in four publications in the appendix, while for one study the respective table was not cross-referenced to any text section. Twenty (20) publications did not follow the classic scientific article structure (i.e. introduction, methods, results, etc.) so that the data presentation could not be clearly associated to any of those types. Only 38 out of 97 publications focused solely on the characterisation of the waste materials, whereas in 59 publications characterisation data were presented as part of other objectives. This indicates that not all publications offering waste data had waste characterisation as primary focus, but rather focused on other aspects such as evaluation of specific waste treatment processes. As such, these studies may also offer valuable waste characterisation data. On the other hand, such studies provided less information about sampling, analytical methods and the origin of the waste. Overall, we found that 40 out of the 97 publications provided no information about where and how the samples were obtained, and for additional eight publications the information was incomplete.

Thirteen (13) publications provided all or parts of their characterisation data in figures. In two cases, the authors responded to our contact and provided the related dataset. For the other publications, data were approximated from the figures as previously described.

3.1.4. Characterisation approaches

As already described in the introduction, waste characterisation methods can be classified into three categories (Brunner and Ernst, 1986); two of these are addressed in this overview: direct waste analysis and waste product analysis (or indirect waste analysis). The dominant type of characterisation method used in the reviewed publications was direct waste analysis, accounting for 64% of the evaluated database entries (Figure 2). Six publications (2% of database entries) used waste product analysis or SFA to estimate elemental concentrations in the input waste, and in five publications outputs from waste incinerators were investigated for this purpose (Astrup et al., 2011; Belevi and Moench, 2000; Morf, 2006; Morf et al., 2013; SAEFL, 2004). One publication used secondary data for multiple waste treatment facilities to track substance flows back to the combined MSW (Korzun and Heck, 1990).

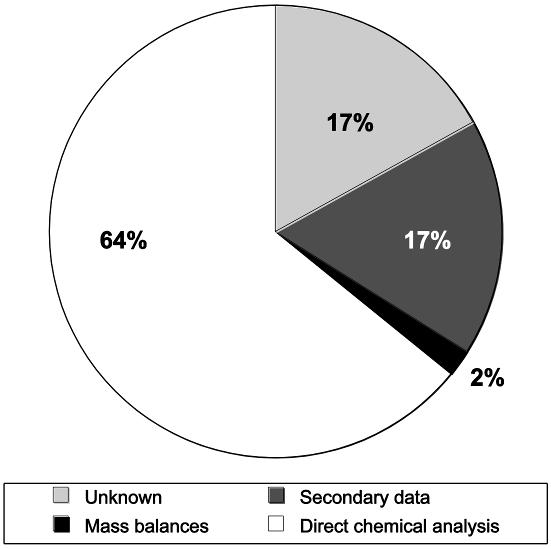

Figure 2: Prevalence of characterization methods, expressed as share (%) of 11,886 database entries

The employed characterisation approaches differed, however, substantially between the individual parameters. Detailed information on the frequency of the employed approaches for every parameter is available in Table A5 in Appendix A. For heavy metals and toxic elements, on average 76% of the data points for each element originated from direct chemical analysis, whereas only 6% originated from mass balance calculations and 8% from secondary data reporting. For 9% of the data for heavy metals, the characterisation method or original source was not reported. For nutrients and organic elements, on average 61% of the data points for the individual parameters were obtained using direct waste analysis. Only 1% of the data for C, H, S and O were based on mass balance calculations, while for N no values at all were obtained via waste product analysis. For P, K, Na, Mg and Ca, the share of data points derived from waste products analysis was between 4% and 8%, while secondary data reporting was more common for the elements N, C, H, S and O (average 21% of the respective data sets) than for P, K, Na, Ca and Mg (on average 7% of the respective data points). For about 20% of the data points relating to nutrients and CHNO, no information on the characterisation method was provided. The reported energy contents (HHV and LHV) and ash contents were mostly obtained from experimental measurements (55-58% of the data points), whereas waste product analysis was used only by a single publication to determine the LHV. For about 20% of the data points no information on the characterisation methods was provided, and 17-27% of the data points originated from other cited publications which were not accessible. Also, for Cl, F and Br, direct chemical analysis was the most common waste characterisation method. Many elements which have been recently under discussion because of their strategic criticality and supply risks were only investigated using waste product analysis (Bi, Ga, Gd, Ge, Hf, In, Nd, Pr, Pt, Rb, Rh, Ru, Ta and Te). For Ag, Au, B, Li, Nb, Sc, Sn, Sr, Ti, W, Y and Zr direct chemical waste analysis was also reported by 25 50% of the relevant publications.

3.1.5. Parameters and material fractions investigated

Most of the reviewed publications focused on specific materials found in waste (64 publications), whereas 33 publications focused on a wider range of material fractions found in MSW or household waste (HHW). Most publications investigated only a few waste fractions and a limited set of physico-chemical parameters, while publications dealing with many different material fractions and many parameters were scarce (Figure 3). Sixty-three (63) publications provided information for one to nine parameters, while six publications provided information only on one parameter and 15 publications investigated more than 20 parameters.

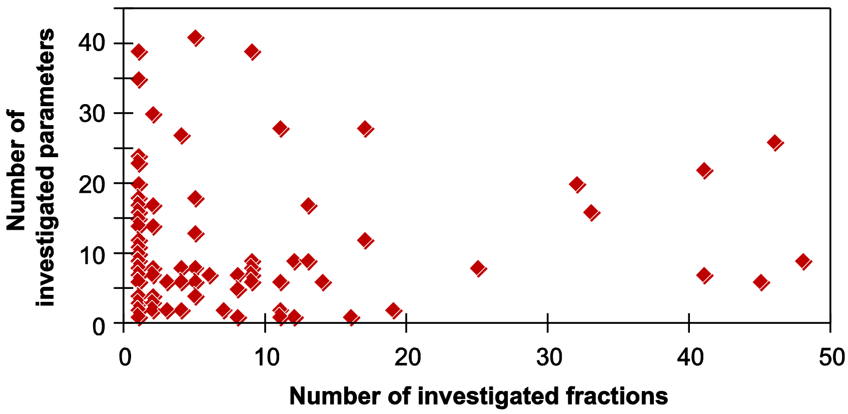

Figure 3: Overview of the reviewed 97 publications with respect to number of investigated material fractions and physico-chemical parameters.

The most parameters analysed were found in Boldrin and Christensen (2010) (41 parameters; source-segregated garden waste fractions), in Eisted and Christensen (2011) (39 parameters; Greenlandic household waste fractions) and in Morf et al. (2013) (39 parameters; MSW via waste product analysis). The most material fractions were investigated by Kost (2001) (48 fractions), Riber et al. (2009) (46 fractions), Rotter (2002) (41 fractions) and Maystre and Viret (1995) (41 fractions). The majority of publications (57) investigated fewer than five waste material fractions, while 45 publications did not subdivide the investigated waste into fractions at all. Only seven publications dealt with more than 30 distinct waste fractions. Categorising the materials investigated in the selected publications according to the 11 defined waste fractions, the most investigated material fractions were: mixed waste (49 publications), plastics (44), paper and cardboard (39), combustibles (39) and food waste (38) (Figure 4).

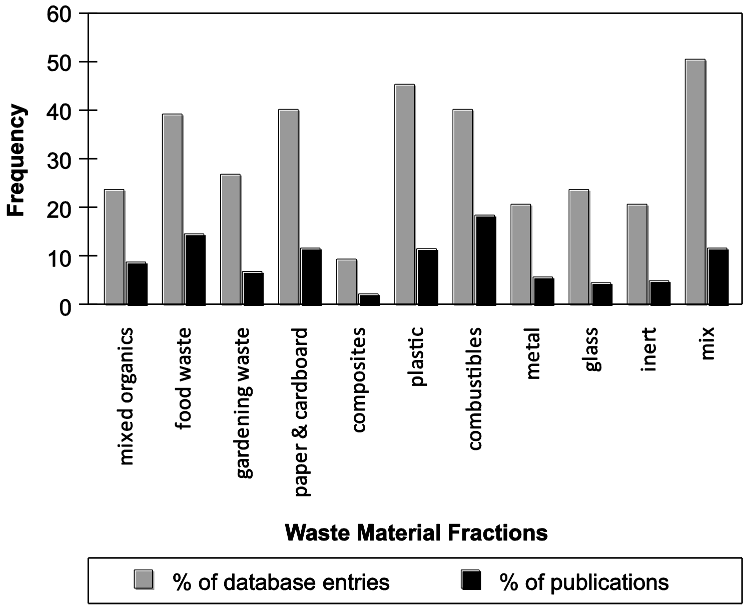

Figure 4: Data availability per waste material fraction based on 97 publications containing a total of 11,886 database entries

Only nine publications investigated composite material fractions. Publications that provided both very detailed fractions and many physico-chemical parameters were: Riber et al. (2009) (26 parameters; 46 fractions), Tchobanoglous et al. (1993) (22 parameter; 41 fractions), LfU (2003) (20 parameters; 32 fractions), Bailie et al. (1997) (16 parameters; 33 fractions) and RIVM (1999) (28 parameters; 17 fractions).

Overall, we found data for 62 parameters in waste materials. However, the number of available database entries varied significantly between parameters and waste material fractions (Figure 5). Only for about 15 parameters, data were collected across in all 11 waste materials. For 30 parameters, median values were not calculated for all material fractions due to lack of data, while for 13 parameters only a single database entry was found. The most frequently analysed parameter in the reviewed publications was Cd with a total of 675 database entries, followed by Pb (659 database entries) and Zn (645 database entries). Most Cd data were found for combustible waste (128 database entries). This suggests that the focus of many publications was quantification of trace contaminants of environmental concern. A detailed overview of the number of database entries found for all parameter-material combinations is provided in Table A4 in Appendix A.

3.2. Value ranges and parameter-specific information

The following sections provide an overview and discussion of the collected waste characterisation data grouped according to parameter types (heavy metals and toxic elements, nutrients and CHNO, energy related parameters, and high-tech application elements): i) an overview of data availability, ii) quantification of median concentrations and data ranges when this was possible based on the collected data, iii) discussion of exceptional observations and outliers, and iv) an overview of the analytical and characterisation methods applied.

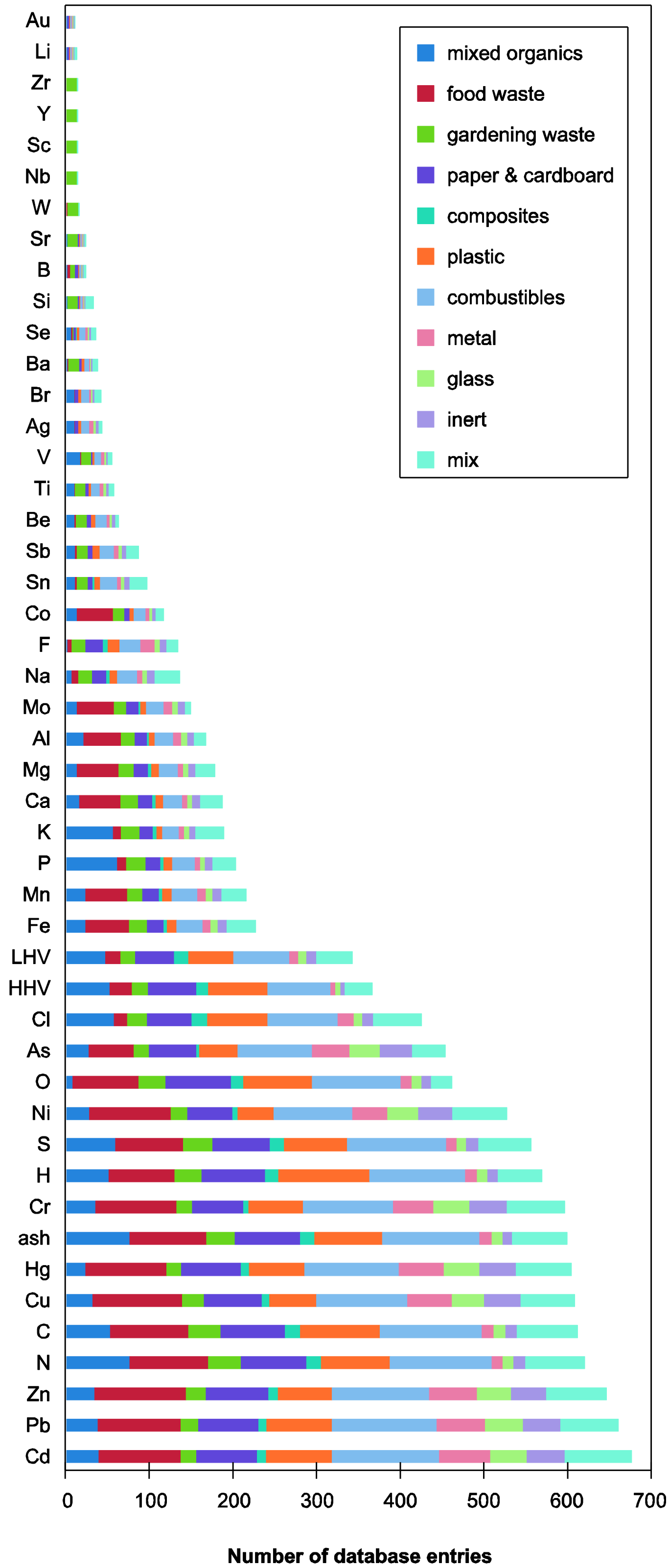

Figure 5: Collected database entries for different parameters and waste material fractions (only parameters with 10 or more database entries are displayed).

3.2.1. Heavy metals and toxic elements

In following sections collected data for the elements Al, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Sb, Tl, V, and Zn are presented and discussed.

Data Availability

The best data availability was observed for Cd with 675 database entries, translated into 869 data points. An extensive amount of data was also found for Pb (828 data points), Zn (719 data points) and Hg (751 data points). For Cu, Cr, Ni and As, significant amounts of data were available for all waste material fractions except for composites (fewer than 10 data points). For Fe, Mn, Al, Mo and Co, we found very little data for two or more material fractions (fewer than 10 data points). Data availability for Fe and Mn in glass and composite, for Mo and Co in composite, and for Co in plastic, glass, inert, metal and paper was insufficient to provide a reliable dataset as fewer than five data points were available for each element-material combination. Moreover, all or 90% of the data points for Mo, Co and V in food waste refer to values reported below the detection limit (detection limits were used as concentrations) adding uncertainty. For Be and Ba more than five data points were only available for the waste fractions combustibles and mixed waste. Only two database entries for Tl concentrations in mixed waste were found.

Median concentrations and data ranges

Due to the extensive amount of data involved, only selected results are discussed below. As an example, box-whisker plots and the corresponding quantiles for Hg concentrations are presented in Figure 6 and Table 2. Similar information for all 47 parameters can be found in Appendix B.

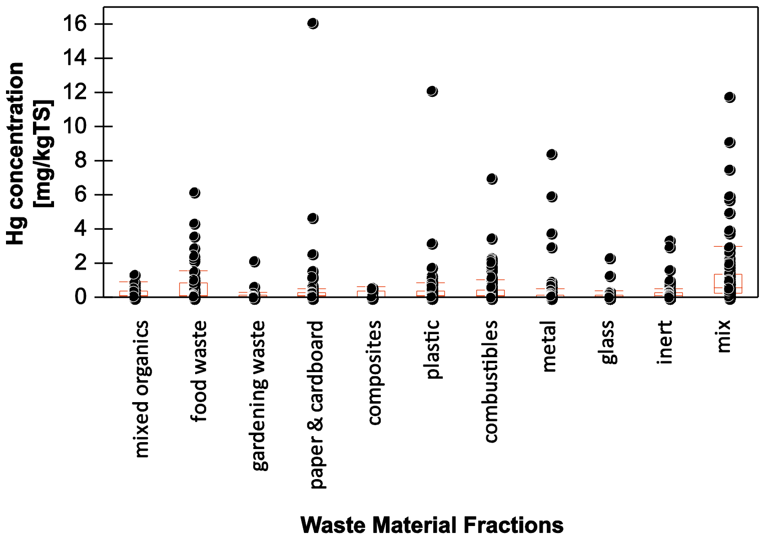

Figure 6: Box-whisker-plots and data points for Hg concentrations in different waste material fractions reported in literature. The displayed whiskers correspond to the upper quartile plus the interquartile range multiplied with the factor 1.5 and the lower quartile minus the interquartile range multiplied with the factor 1.5. All values beyond these points are considered as outliers. Similar information for 47 parameters is available in Appendix B.

Table 2: Quantiles of Hg concentrations (mg/kgTS) reported in literature in, "ndata": total number of data points; "n<DL": number of data points below detection limit, "food waste –alternative" presents quantiles when excluding 40 entries from WRAP (2010), which were below the detection limit. Similar information for 47 parameters is available in appendix B.

Waste Material Fraction	n_{data}	$n_{<DL}$	Min	10%	25%	Median	75%	90%	Max
organic	34	4	0.000	0.020	0.040	0.100	0.396	0.850	1.400
food waste	99	41	0.000	0.020	0.100	1.120	2.000	2.000	6.250
food waste-alternative	*59*	*1*	*0.000*	*0.000*	*0.040*	*0.140*	*0.870*	*2.310*	*6.250*
gardening waste	20	3	0.000	0.020	0.023	0.040	0.198	0.629	2.170
paper & cardboard	84	6	0.000	0.000	0.030	0.098	0.265	0.570	16.160
composites	14	-	0.000	0.000	0.008	0.025	0.380	0.595	0.640
plastic	89	3	0.000	0.000	0.045	0.130	0.400	0.891	12.150
combustibles	140	6	0.000	0.000	0.050	0.110	0.470	1.573	7.030
metal	60	5	0.000	0.000	0.000	0.025	0.200	0.790	8.500
glass	49	6	0.000	0.000	0.000	0.040	0.200	0.340	2.350
inert	49	5	0.000	0.000	0.015	0.100	0.285	0.900	3.420
mix	113	-	0.000	0.070	0.235	0.580	1.375	3.928	11.800
Total	751	79							

Metal waste presented the highest median concentrations for Cr, Cu, Ni, Fe, Mn, Al, Mo and Co (see Table 4), while the lowest median concentrations of Cr, Ni, Fe, Al and Co were observed in food waste. The lowest median Cu concentration was found in glass and the lowest median Mn concentration in plastic. The lowest median Cd concentration was found in paper & cardboard (0.3 mg/kgTS) and the highest in composite materials (2.5 mg/kgTS). The largest data variation for Cd was found in plastic, combustibles and metals. The lowest median Pb concentration was found in gardening waste (9.6 mg/kgTS) and the highest in mixed waste (191.9 mg/kgTS). Large variations of the reported Pb concentration were found in metal, inert materials and combustibles. The lowest Zn concentration was found in glass (55 mg/kgTS) and the highest in plastic (259 mg/kgTS). For Zn, we observed large variations in the reported concentration levels, particularly for metals, combustibles, plastic and inert waste. Surprisingly, the highest median Hg concentration was found in food waste (1.12 mg/kgTS) with a value twice as large as the median found for mixed waste (0.58 mg/kgTS). However, 41 out of 99 data points for Hg in food waste were below the detection limit (Table 2). Almost all of these semi-quantitative entries originated from WRAP (2010), reporting a rather high detection limit of 2 mgHg/kgTS. Indeed, Hg concentrations higher than 2 mg/kgTS were reported in food waste by other publications (i.e. Zhang et al., 2008 and Ferrari et al., 1998). By excluding the entries from WRAP (2010), the median concentration in food waste was indeed much lower (0.14 mg/kgTS), but food waste still represented the second-highest median concentration after mixed waste. The lowest median Hg concentration was observed in metal and composite (0.025 mg/kgTS). Generally, the data for Hg showed large variations in all material fractions as well as many very distant outliers in high concentration levels (Figure 6).

The highest median As concentration was found in glass (36 mg/kgTS) and the lowest in composites (0.2 mg/kgTS). Very large data variations were found for glass, metal and combustibles. The highest median Sb concentration was found in mixed waste (63 mg/kgTS) and the lowest in gardening waste (0.04 mg/kgTS).

Outliers, exceptional observations and limitations of the calculated value ranges

For some metals, the reported concentrations differed significantly between ferrous and non-ferrous material samples (Table 3). As expected, this was especially the case for the elements Fe and Al, though it also applied to Mn, Co and Cu. As a consequence, data variations in metal were very large. The presented median values for Fe, Al, Mn, Co and Cu in the general metal material fraction are therefore unlikely to represent metal waste materials which are sorted according to their iron content (e.g. by magnetic separators).

Table 3: Comparison of metal concentrations (median values, rounded to three significant digits) in metal waste fractions; ferrous metal, non-ferrous metal, and metal waste in general.

Parameter	Unit	Ferrous Metal	Non-ferrous Metal	Metal
Fe	mg/kgTS	885,000	23,900	493,000
Al	mg/kgTS	4,880	689,000	172,000
Cu	mg/kgTS	104	39.0	94.5
Mn	mg/kgTS	970	3,040	1,780
Co	mg/kgTS	43.5	18.5	32.0

In the mixed organics fraction higher concentration levels for many elements originated from a publication of RIVM (1999), describing a green waste fraction with particle sizes of 8-20 mm. This could be due to dust or soil which is expected to accumulate in small particle fractions. This observation should be considered when comparing waste materials which have undergone or are supposed to undergo a sieving step. In the combustible material fraction, the largest data variations and relatively high concentrations of the elements Cd, Zn, Hg, Cr and Sb were reported for waste materials such as textiles, rubber and leather. Sanitary products and wood generally showed lower values, which were close to the 25% percentile of the combustible fraction. Some individual data points for Pb, Mn, As and Co in wood showed much higher concentrations than the rest of the data – very likely due to the abundance of wood preservatives in the corresponding samples (e.g. Astrup et al., 2011). High Cd, Sb and Zn concentrations in plastic could be tracked back to non-packaging plastic and plastic items (Rotter et al., 2003), and for plastic samples consisting of non-packaging material, concentrations of these elements were likely to be in the upper quartile of the provided ranges. Very high outliers for the elements As, Hg, Ni, Cr and Cu in almost all materials, i.e. plastic, paper and cardboard, combustibles (especially textiles, leather and rubber), glass and food waste, could be tracked back to Zhang et al. (2008), whose study examined monthly samples of Chinese waste from different treatment facilities, the reported values for which showed very high variations for these elements. While this may indicate higher concentrations in Chinese waste, no other publications offered comparable repetitions in sampling and analysis of independently obtained samples for the same waste materials. For food waste, up to half or more of the values originated from detection limits. Almost all of these entries below the detection limit for food waste originated from WRAP (2010), which investigated food waste in different municipalities in Wales (UK). In the study, numerous samples were analysed, but almost all the results for heavy metals were reported below (rather high) detection limits, in particular for Hg. As all these database entries were included in the evaluation (to reflect that a concentration below detection limit represents some level of information) with an identical value, the calculated quantiles for food waste should be used with caution. For the elements Cd, Pb, Hg, Cu and Ni in food waste, 35-50% of the collected data points were reported below the detection limit, while for Mo, Co and V in food waste, the calculated quantiles were extremely uncertain, as 90-100% of the collected data points referred to measurements below the detection limit.

Characterisation and analytical methods

On average, 49% of the publications reporting values for heavy metals and toxic elements employed a direct chemical analysis of the waste, which corresponds to 76% of the database entries. The most frequently used analytical methods were inductively coupled plasma (ICP)-based techniques (on average 71% of publications; 59% of database entries) and atomic absorption spectroscopy (AAS) with flame atomisers (22% of publications, 28% of database entries). The X-ray fluorescence analyser (XRF) was only used to analyse Cd, Cu, Cr, Fe, Mn, Ni, Pb and Zn, contributing between 3% and 10% of the respective datasets from direct analysis. Depending on the individual element, 24% to 100% of the data points from direct analysis were obtained with ICP-based methods. The lowest shares of data points obtained with ICP were identified for Pb (24%), Hg (26%), Cd (31%) and Zn (31%). Due to its special properties, different techniques were employed for Hg analysis: 41% of the data points from direct analysis of Hg were measured using atomic fluorescence spectroscopy (AFS), 20% using hydrid AAS, 8% using cold vapour AAS and only 3% using a special Hg analyser. For Pb, 39% of the data from direct chemical analysis were measured using flame (or not specified) AAS, 17% were measured using flameless AAS, 10% using XRF and 10% using absorptiometry. Most data from the direct analysis of Cd were obtained using flame AAS (47%), though a considerable share was measured with flameless AAS (20%).

3.2.2. Nutrients and CHNO elements

In the following sections collected data for the elements C, H, N, O, Ca, K, Mg, Na,, P, S, Se, and Si are presented and discussed.

Data Availability

The best data availability among nutrients and organic elements was found for N with 619 database entries, corresponding to 940 individual data points. An extensive amount of data was also found for C (911 data points), H (825 data points), S (766 data points) and O (699 data points). For the elements P, K, Ca, Na and Mg only little data (10 or fewer data points) were available for the materials metal, glass and inert, while for plastic and composite waste the data availability was generally low (fewer than four data points available). The data availability for Si in all materials except for mixed waste and gardening waste was insufficient (less than 5 data points). Also the data availability for Se in all fractions but mixed waste was insufficient to provide a reliable dataset and about half of the existing data points were reported below the detection limit making them even less uncertain.

Median concentrations and data ranges

The highest median concentrations for Ca, Na, Mg and Si were found in glass, whereas N, C, H and P provided the lowest median concentrations in glass (Table 4). The lowest median concentrations of S, K, Ca, Na and Si were found in metals, while the lowest median Mg concentration was found in food waste (274 mg/kgTS); the reported Mg concentrations in inert, metal and glass varied extensively. The highest median K concentration was found in inert waste (12.6 g/kgTS), and the data variation was very large in organic, food and gardening waste. For N and S the highest median concentrations were found in food waste (3%TS and 3780 mg/kgTS, respectively) and for C and H in plastic waste (73.0%TS and 9.7%TS). The reported C concentrations varied considerably for all waste materials, especially for food waste, plastics, combustibles and mixed waste. For P, the highest median concentration (17.9 g/kgTS) was found in mixed waste, where the largest variation among the reported concentrations was also observed. Furthermore, in the mixed organic, food waste and gardening waste fractions, large data variations for P were observed. The highest median O concentration was found in paper and cardboard (41%TS) and the lowest was found in inert waste (0%TS). Due to a lack of data, Si concentrations could be evaluated only for mixed waste and gardening waste. The median Si concentration in gardening waste was 144 g/kgTS; however, the data reported for this fraction varied significantly.

Table 4: Overview on lowest and highest median values for 32 selected parameters in different waste material fractions. Hg*: when excluding 40 entries from WRAP (2010) on food waste, which were below the detection limit. This matter is discussed in detail in chapter 3.2.1 and respective alternative values can be found in table 2.

Waste Material Fraction	Highest Median	Lowest Median
Mixed organics	-	-
Food waste	Hg*, N, S	Cr, Ni, Fe, Al, Co, Mg
Gardening Waste	-	Pb
Paper & Cardboard	O	Cd, Sn, Ti, Ag
Composites	Cd	As
Plastics	Zn, C, H, Cl, HHV, LHV, Ti	Mn, Ash
Combustibles	-	-
Metals	Cr, Cu, Ni, Fe, Mn, Al, Mo, Co, Sn, Ag	-
Glass	As, Ca, Na, Mg, Si, Ash	Cu, Zn, N, C, H, P, Cl, F
Inert	K	O
Mixed Waste	(Hg)*, Pb, P, F	-

Outliers, exceptional observations and limitations of the calculated value ranges

For N and C large data variations were observed for the combustible waste fraction. Subdividing this fraction (where possible based on the literature), it was clear that the data for sanitary products and wood had lower variability compared to textiles, rubber and leather and other small combustibles. The highest values for both elements were reported in textiles, rubber and leather. The highest N concentrations were found mainly for leather and the highest C concentrations for rubber. The highest N concentrations in plastic materials were reported for a polyurethane sample, reflecting the fact that urethane groups contain a nitrogen atom. However, also for mixed plastic waste, four very high and outlying concentrations were found without any plausible explanation. A distant outlier for C and H in metal could be tracked back to a sample called “metal-like foil” (Riber et al., 2009), suggesting that this sample contained some sort of plastic laminate or coating. For the elements C, H, N, S, P and K, we found a considerable difference between vegetable food waste and animal-derived food waste (Table 5).

Table 5: Comparison of nutrients, carbon, and hydrogen concentrations (median values, rounded to three significant digits) in food waste fractions: animal derived food waste, vegetable food waste, and food waste in general.

Parameter	Unit	Animal-derived Food Waste	Vegetable Food Waste	Food Waste
C	%TS	55.9	42.7	47.9
H	%TS	8.40	6.60	6.50
N	%TS	10.4	1.90	3.00
S	mg/kgTS	7,520	2,290	3,780
P	mg/kgTS	12,000	2,120	5,200
K	mg/kgTS	6,480	25,300	8,900

Except for K, the median concentrations were found to be higher in animal-derived food waste than in vegetable food waste. The P and K concentrations in Nigerian mixed waste, reported by Olajire and Ayodele (1998), were remarkably higher than those from other publications. In addition, high P concentrations in Indian mixed waste were reported by Das et al. (2013). Outliers for K and Mg in combustibles could be tracked back to fractions such as cigarette butts and vacuum cleaner bags. The rather "exotic" fraction called "dead animals," reported by Riber et al. (2009), which we attributed to the gardening waste material fraction, presented very high and outlying Ca and Mg concentrations. The highest Na and Mg concentrations in paper and cardboard were reported by Tchobanoglous et al. (1993), citing an inaccessible original source. The same publication reported Ca concentrations 0 mg/kgTS in paper and cardboard, which may be questionable as calcium carbonate is often used as filling material in paper production (Auhorn, 2012).

Characterisation and analytical methods

For nutrients and CHNO elements, on average 61% of the data points for the individual parameters were obtained using direct chemical analysis. Only 1% of the data for C, H, S and O were based on mass balance calculations, while for N no values were obtained via waste product analysis. For P, K, Na, Mg and Ca, the share of data points derived from waste products analysis was between 4% and 8%. Secondary data reporting was more common for the elements N, C, H, S and O (average 21% of the respective datasets) than for P, K, Na, Ca and Mg (on average 7% of the respective data points). For about 20% of the data points for nutrients and CHNO elements, no information on the characterisation method was provided. The most common analytical method used for the analysis of C, H and O was elemental analysis based on sample combustion and the detection of gaseous components, which was employed for 83%, 100% and 83% of the waste samples, respectively. Alternative methods for determining C were total organic carbon analyser (TOC) suitable for solids (11% of the publications) and approximation via volatile solids (6%). Only 52% of the publications (82% of data points) reporting experimental values used elemental analysis to determine N, and 48% used the Kjeldahl method. However, this corresponds only to 18% of data points, reflecting the fact that the Kjeldahl method is a very time-consuming procedure. For the determination of S, 40% of the publications chose elemental analysis, 40% ICP after acid digestion and 14% ion chromatography (IC) or titration after combusting the sample and absorbing resulting SO2 in an absorption solution. The most common analytical methods for analysing P, K, Na, Mg and Ca were ICP-based technologies after acid digestion of the solid samples (63% to 83% of the publications).

3.2.3. Parameters related to energy conversion

In the following sections collected data for the higher and lower heating value, the ash content, Br, F, and Cl are presented and discussed.

Data Availability

Among the parameters related to energy conversion most data were available for the ash content; 598 database entries were found, which were subsequently converted into 892 data points. The reviewed literature also presented a large amount of data for Cl (414 database entries, 892 data points). We found 365 database entries for the higher heating value (HHV) (474 data points) and slightly fewer (i.e. 341 database entries) for the lower heating value (LHV). The least amount of information on energy content was found for inert and glass materials, and there was a particular paucity of information on F (133 database entries, 141 data points) and Br (41 database entries, 49 data points). For F concentrations in the waste material fractions inert, glass, composites and food waste, fewer than 10 data points were available, and in mixed organics fewer than five data points, making a statistical evaluation difficult. For Br concentrations, we found more than 10 data points only for mixed waste and combustibles, and more than five data points only for mixed organics, whereas for all other waste material fractions the data found was little or insufficient to provide a reliable dataset.

Median concentrations and data ranges

The highest median ash contents were found for glass (99%TS), inert (97%TS) and metal (97%TS), while the lowest median occurred for plastic waste (10%TS) (see Table 4). The highest median value for HHV and LHV was found in plastic (33.5 MJ/kgTS and 30.5 MJ/kgTS, respectively) and the lowest in metal and glass (0.0 0.4 MJ/kgTS). Two out of six values for the HHV in glass, and one out of five in the inert material fraction, were reported below the detection limit. Variations among the data for Cl were generally high. The highest median Cl concentration was found for plastic (1.3%TS) and the lowest was found in glass (0.000%TS). The highest median F content was found in mixed waste (0.05%TS) and the lowest in metals and glass (0.000%TS). The quantiles for F in glass, composites and food waste were uncertain, as fewer than 10 data points were available. As 12 out of 16 data points for F in gardening waste were reported below the detection limit, the resulting quantiles are very unreliable and only one data point was found for F in organic waste. The median Br content was highest in mixed waste (0.016%TS), and the lowest median Br concentration of 0.001%TS was found in food waste, paper and cardboard, metal, glass and inert. For all waste material fractions except mixed waste, half or more of the available data were below the detection limit.

Outliers, exceptional observations and limitations of the calculated value ranges

WRAP (2010) reported VS contents for food waste from 25 towns and contributed with 120 to overall 196 data points (61%) in the dataset for the ash content in food waste. While the data were labelled "volatile solids" and we calculated values for the associated ash content. However, the resulting ash contents appeared significantly higher than the corresponding values found in all the other publications and ash contents of 70-90%TS in 25 independent food waste samples is extremely unlikely. On this basis, we concluded that the presented values (WRAP, 2010) labelled as volatile solids must actually represent the reciprocal ash content values and we decided to include the data under this assumption. Generally, the ash content data showed large variations, especially for mixed and gardening waste. The highest ash contents for gardening waste were reported for sieved fine fractions, possibly due to high contents of soil and dust, while the lowest reported ash content in gardening waste originated from secondary data, for which the original source could not be accessed. In combustibles, the highest values were reported for vacuum cleaner bags and carpets. Interestingly, the ash contents reported for individual polymers were much lower than for mixed plastic scraps or other undefined plastic samples, possibly due to cross-contaminations, which may be removed more efficiently when checking every single plastic item for information on polymer types. The data for Cl in plastic waste varied significantly, showing clear differences between polymer types. The highest median Cl content of 47.2%TS occurred as expected in PVC, the median in HDPE was 18%TS and for the other polymer types the median Cl concentrations accounted for only 0.1%TS. Consequently, the abundance of PVC and HDPE in mixed plastic streams could be important when Cl contents are of concern. Very high concentrations of Cl and Br in the combustible material fraction were reported for the leather and rubber samples. The highest heating values reported for metals originated from ADEME (2007) and were 10 times higher than the second highest values. Although no publications addressed the analysis of metal samples separately, it is unlikely that the reported values (except ADEME, 2007) were obtained from oxygen-bomb-calorimetric measurements, because metals show considerable heat development in an oxygen atmosphere, as reported by Grosse and Conway (1958). Heating values for vacuum cleaner bags were among the lowest in the material fraction combustibles, which is in agreement with the very high ash content in these samples. The highest heating values in the combustible material fraction were reported for rubber samples. Considerable differences in energy contents of individual polymers in the plastic material fraction were observed: The lowest median HHVs were found in PVC (22.5 MJ/kgTS), PET (23.8 MJ/kgTS) and PU (26.1 MJ/kgTS), while the other polymers presented higher median HHV ranging from 38 to 45 MJ/kgTS. Also, in the food waste fraction, considerable differences were observed between animal-derived food waste (25.3 MJ/kgTS) and vegetable food waste (15.3 MJ/kgTS).

Characterisation and analytical methods

In approximately 33% of the publications, and for approximately 55% of the data points, heating values were determined experimentally using an oxygen-bomb calorimeter; only one publication used waste product analysis of an incineration plant. Approximately half of the publications did not report from where the presented heating values originated (corresponding to about 20% of the data points). The remaining data originated from inaccessible primary sources. Also, for ash content, 52% of the publications (21% of data points) did not report any method or primary source. In 33% of the publications, and for 57% of the data points, experimental approaches were used for ash content determination. No ash content data were obtained via waste product analysis. Within the data from the experimental determination of ash content, various treatment temperatures were used. The majority of publications and data points used a temperature of 550°C, which is recommended by several standard methods (e.g. CEN 14775, CEN 15403 and US EPA method 1684) for waste-derived fuels and biomass. One publication and 28% of the data were obtained using 900°C. High temperatures between 815°C and 950°C were prescribed by standardised methods for coal analysis (e.g. ISO 1171, ASTM D3175) but as biomass and waste have a higher content of inorganic but volatile salts, which evaporate at such high temperatures, methods designated to coal analysis overestimate the VS content of waste (CEN, 2009). For Cl, a considerably high share of the publications (i.e. 52%) did not report how the presented Cl concentrations were determined, while 26% of the publications (43% of the data points) reported having used chemical analysis. For F and Br, the shares of data originating from chemical analysis were 70% and 84%, respectively. Only 10% of the publications presenting data for Cl (3% of data) used waste product analysis. For F and Br, 10% and 11% of the data were obtained via waste product analysis. The dominant experimental method for Cl determination, used by 63% of the publications (i.e. 55% of the experimental data), was combustion either in a bomb calorimeter or via Schoniger combustion, followed by absorption of the combustion gases into a liquid and then ion content measurement via IC. In addition, ICP technologies after sample digestion were employed by 25% of the publications, thus corresponding to 27% of the data. For the chemical analysis of F and Br content, ICP technologies dominated.

3.2.4. High-tech application elements

In the following sections collected data for the elements Ag, Au, B, Bi, Ga, Gd, Ge, Hf, In, Li, Nb, Nd, Pr, Pt, Rb, Rh, Ru, Sc, Sn, Sr, Ta, Te, Ti, W, Y, and Zr are presented and discussed.

Data Availability

The data availability for these elements was generally lower than for the other element groups previously discussed. While WEEE and hazardous waste fractions were not addressed in this study, data availability for these waste fractions should be somewhat better as these elements are typically more abundant in electronic products. Furthermore, data were mostly found in recent publications, demonstrating an increased interest in recent years, e.g. related to discussions on criticality and strategic supply risks (Buchert et al., 2009; European Commission, 2010; US DOE, 2010). Most data in this group of elements were found for Sn (96 entries, 120 data points). For several material fractions little data was available; for plastics and inert waste fewer than 10 data points, and for glass, composites and food waste fewer than five data points were found. Additionally, nine of the database entries had values below the detection limit, thereby increasing uncertainty of these values, especially for material fractions such as metal, paper and plastic. For Ti, Ag, B and Sr, no data were found for composites, while very few data points were found for all other waste material fractions. For Ti, fewer than 10 data points were available for organic waste and fewer than five for paper, plastic, glass, inert and food waste. For Ag only 10 data points were found for combustibles and even fewer for all other material fractions. Additionally, half of the values in food waste and all values in plastic were below the detection limit. For concentrations of B in the fractions organic, plastic, metal, glass and inert waste, only one data point was available per material fraction; similarly, for Sr in all waste material fractions except mixed waste and gardening waste, only one or two data points were found. Concentrations of W were only found for gardening, food and mixed waste. For the elements Nb, Sc, Y and Zr, only data for mixed waste and gardening waste were found, and nearly all values for Nb in gardening waste were below the detection limit. Very few data and mostly values below the detection limits were found for Li and Au, and only one database entry was found for each of the elements Bi, Ga, Gd, Ge, Hf, In, Nd, Pr, Pt, Rb, Rh, Ru, Ta and Te.

Median concentrations and data ranges

Overall, the quantiles calculated for the elements in this group should be considered highly uncertain due to limited data with many values below the detection limit. For many waste material fractions medians could not be calculated. Comparison across individual fractions was possible only for the following elements (see all results in Appendix B): For Sn, the highest median was found in metal (1620 mg/kgTS), though the data varied significantly and a considerable difference between ferrous (1700 mg/kgTS) and non-ferrous metals (499 mg/kgTS) was found. The lowest median Sn concentration was found in paper and cardboard (1.4 mg/kgTS). For Ti, the highest median concentration was found in plastic (4200 mg/kgTS), possibly originating from titanium dioxide pigments, and the lowest in paper and cardboard (13 mg/kgTS). Within the combustible waste material fraction, Ti concentrations were higher in leather, rubber and carpets than in wood and textiles.

Outliers, exceptional observations and limitations of the calculated value ranges

Morf et al. (2013) offered the only source of data for Bi, Ga, Gd, Ge, Hf, In, Nd, Pr, Pt, Rb, Rh, Ru, Ta and Te based on waste product analysis; however providing data only for the mixed waste input to an incinerator also receiving shares of industrial waste. Boldrin and Christensen (2010) provided the only source for Nb, Sc, Y and Zr in gardening waste, while Li and Au contents were investigated only by Morf et al. (2013), Eisted and Christensen (2011) and Belevi and Moench (2000).

Characterisation and analytical methods

As discussed previously for many elements in this category, only data from waste product analysis were available. However, for Ag, Au, B, Li, Nb, Sc, Sn, Sr, Ti, W, Y and Zr, data from direct chemical analysis were also found. The share of experimental data varied between 50% and 80%, depending on the individual elements. When direct chemical analysis was used, mostly ICP technologies were employed, while for the determination of Sn content, AAS (14% of data points) and XRF (23% of data points) were also used.

3.3. Data gaps and implications for environmental assessment

Significant amounts of physico-chemical data were published in non-ISI publications, e.g. grey literature, reports and theses. While publication of data in grey literature or local languages may be understandable, this may also limit accessibility to the data and limit the possibility to put new data sets into context. The dataset discussed in the previous sections, however, offers a systematic collection of waste composition data. The data sets provided in the appendixes may serve as a basis for identifying relevant data for individual waste material fractions to be used as input data in environmental assessment modelling, e.g. in relation to quantifying the environmental impacts by increasing source-segregation of recyclables or mixed waste to incineration.

Only few waste characterisation data were found for emerging economies and developing countries. Thanks to some Chinese publications, Asia was relatively well represented; however, composition data from other Asian countries, especially tropical countries, were very scarce, and almost no data were found for regions such as the Middle-East and South America. As consumer behaviour and legislation in those countries may differ considerably from industrialised countries, the waste composition is likely to be significantly different as well. Applying waste composition data e.g. from Europe in life cycle assessment modelling of waste systems in other regions may potentially lead to wrong results and erroneous decisions. As such, further chemical characteristics of waste from less industrialised regions or regions with significantly different lifestyles, incomes and demographics are needed.

Very little data for precious metals and rare earth elements were found in literature. In most developed waste management systems, WEEE fractions may be handled separately from mixed household waste, or may be present only in very small quantities. Therefore, chemical composition data for these elements in MSW fractions should be applied in modelling with caution. However, linking these - often very low - concentrations to points of dissipation could provide valuable inputs for development of strategies for more resource-efficient systems by minimising such dissipation. Moreover, concentrations of some of these elements may become interesting in relation to research into nanoparticles and their dissipation in the environment (e.g. Ce and Ag). As such, further research related to waste characterisation data for elements such as precious metals and rare earth elements in mixed waste flows may be needed to support more detailed environmental assessment studies including these elements.

4. Conclusions

Data for the physico-chemical composition of individual waste material fractions were extracted from existing literature, organised to allow comparison and then statistically evaluated. In total, 97 publications were assessed, providing 11,886 individual database entries. Detailed data for median concentrations and quantiles for 47 parameters (e.g. metals, nutrients, energy and ash content, halogens, rare earth elements) were provided for 11 individual waste material fractions. The literature overview showed that many chemical waste characterisation data are available from China, Europe and North America, while few or no data are available for metals of strategic concern (e.g. rare earth elements). However, the amount of collected data was insufficient for a consistent in-depth analysis of the influence of the regional context on the physico-chemical properties of individual waste materials. A significant share of the data was found in publications with objectives different from waste characterisation itself. Critical shortcomings in data labelling and description of experimental methods (e.g. errors in units, naming conventions, missing information and imprecise description of procedures) were observed for the addressed literature. This clearly suggests that transparency and consistency in data reporting from waste characterisation studies can be improved. Both chemical and physical parameters showed significant variations between publications. For some parameters, these variations could be associated with specific sub-fractions or items (e.g. Fe, Al, Mn, Cu in ferrous vs. non-ferrous metals, Cl in PVC, S in rubber etc.). Application of waste characterisation data from literature in environmental modelling requires careful consideration of data levels, potential influence from experimental methods and focus of the literature source. The overview of data and sources provided here (including the attached detailed datasets) may serve as a platform for more informed data selection e.g. in life cycle modelling where waste composition input data may critically influence the assessment results, as well as to choose appropriate uncertainty ranges.

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Appendix A

for

Physico-chemical characterisation of material fractions in household waste: overview of data in literature

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Table A1: Searched keywords

municipal solid waste, waste characterization, waste composition, waste analysis, waste management, heavy metals, nutrients, energy content or a combination of those terms, as well as translated equivalents in French, Italian, German, and Dutch.

Table A2: Definition of matched waste material fractions

Waste material fraction	Included material fractions as reported
Mixed organics	Sampled fractions called e.g. organic, bio waste, or kitchen waste, which are not further specified and likely contain a mixture of food waste and waste from gardening activities.
Food waste	Waste samples clearly labelled as food waste or organic fractions sampled from restaurants, canteens, butchers, etc.
Gardening waste	Organic waste from private or public gardening activities, e.g. yard trimmings, branches or fractions called green waste with specific description.
Paper & Cardboard	Fractions containing different paper and cardboard products, e.g. cardboard packaging, newspapers, napkins. If very general paper and cardboard fractions were reported laminated paper which we consider as composite material may have been included in this fraction.
Composites	Laminated paper, e.g. juice cartons, laminated plastics e.g. aluminum-coated plastic foil, other sampled fractions called composites
Plastic	Plastic fractions containing different plastic products and polymer types, e.g. plastic packaging and household items. The polymer composition strongly depends on the waste sampling campaign and recycling/ take-back systems in place.
Combustibles	All samples labelled as combustible, wood, sanitary products (e.g. diapers), textiles, rubber, leather, and cigarette butts.
Metal	All samples called metal and more detailedly sorted metal items e.g. aluminium foil, beverage cans, etc.
Glass	Fractions containing glass from different glass products, e.g. glass packaging
Inert	Fractions called non-combustibles or inert, or more detailed fractions such as construction and demolition waste from residual household waste, stones, soil, and ceramics.
Mix	Values reported for residual MSW or HHW, sieved fine fractions from MSW and HHW waste sorting campaigns.

Table A3: List of reviewed publications

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Table A4: Found data entries per parameter and material fraction

No.	Parameter	Mixed organics	Food waste	Gardening waste	Paper & cardboard	Composites	Plastic	Combustibles	Metal	Glass	Inert	Mix	Total
1	Cd	38	98	19	72	11	79	128	61	44	45	80	675
2	Pb	37	99	21	72	10	78	125	58	45	45	69	659
3	Zn	33	109	24	75	11	65	116	57	41	42	72	645
4	N	75	94	39	78	18	82	122	13	13	14	71	619
5	C	52	93	39	77	18	95	122	14	14	14	72	610
6	Cu	31	107	26	69	9	56	109	53	39	43	65	607
7	Hg	22	97	18	71	10	66	113	54	42	44	66	603
8	ash	75	92	34	78	17	81	116	15	13	11	66	598
9	Cr	34	97	19	61	6	65	108	48	43	45	69	595
10	H	50	79	32	76	16	109	114	14	13	12	53	568
11	S	58	81	35	69	17	75	118	13	11	15	63	555
12	Ni	27	97	20	54	6	43	94	42	37	41	65	526
13	O	7	79	32	78	15	82	106	13	12	11	25	460
14	As	26	54	18	57	3	46	89	45	36	39	39	452
15	Cl	56	16	24	53	19	72	84	19	10	13	58	424
16	HHV	51	27	19	58	14	71	75	6	6	5	33	365
17	LHV	46	18	18	46	17	54	67	11	9	12	43	341
18	Fe	22	52	22	20	4	11	31	10	8	11	35	226
19	Mn	22	50	18	20	4	11	31	10	8	11	29	214
20	P	60	11	23	18	4	10	27	6	6	9	28	202
21	K	55	10	22	16	4	7	20	6	6	8	34	188
22	Ca	15	49	21	17	4	9	23	6	6	9	27	186
23	Mg	12	50	18	17	4	9	23	6	6	9	23	177
24	Al	20	45	16	15	2	7	22	10	7	8	14	166
25	Mo	12	44	15	15	2	7	21	10	7	8	7	148
26	Na	6	8	16	17	4	9	24	6	6	9	30	135
27	F	1	5	16	21	6	14	25	17	6	8	14	133
28	Co	12	43	14	6		5	14	5	3	4	10	116
29	Sn	10	2	13	6	2	7	20	5	4	6	21	96
30	Sb	10	2	13	6		8	17	6	4	5	15	86
31	Be	9	2	13	5		5	14	3	3	4	4	62
32	Ti	9	1	12	4		3	10	5	3	3	6	56
33	V	16	1	12	2		2	8	4	2	2	5	54
34	Ag	9	1		4		3	10	5	3	3	4	42
35	Br	9	1		4		3	10	2	2	2	8	41
36	Ba	1	1	13	3		3	6	1	1	2	6	37
37	Se	5	2	1	3	1	3	7	3	2	2	6	35
38	Si	1		12	2		1	3	1	1	1	10	32
39	B	1	3	6	4		1	2	1	1	1	3	23
40	Sr	1		12	2		1	2	1	1	1	2	23
41	W		1	13								1	15
42	Nb			12								1	13
43	Sc			12								1	13
44	Y			12								1	13
45	Zr			12								1	13
46	Li	1			2		1	2	1	1	1	3	12
47	Au	1			2		1	2	1	1	1	1	10
48	Tl											2	2
49	Bi											1	1
50	Ga											1	1
51	Gd											1	1
52	Ge											1	1
53	Hf											1	1
54	In											1	1
55	Nd											1	1
56	Pr											1	1
57	Pt											1	1
58	Rb											1	1
59	Rh											1	1
60	Ru											1	1
61	Ta											1	1
62	Te											1	1

Table A5: Frequency of waste characterization approaches employed for the individual parameters and for the respective element group expressed as % of data points

Element	Direct chemical analysis	Mass balances	Secondary data reporting	Unreported methods
Heavy metals/toxic elements	76%	6%	8%	9%
Pb	78%	2%	15%	5%
Zn	79%	2%	8%	11%
Cu	76%	2%	9%	12%
Hg	71%	2%	17%	11%
Cr	66%	2%	19%	12%
Ni	76%	3%	8%	13%
Al	86%	8%	1%	5%
Fe	75%	5%	3%	17%
Mn	78%	3%	2%	17%
Mo	88%	7%	1%	3%
Co	84%	9%	2%	5%
Sb	48%	11%	28%	13%
V	86%	8%	0%	7%
Be	89%	5%	0%	6%
Ba	71%	27%	0%	2%
Cd	72%	2%	15%	10%
As	74%	3%	14%	9%
Nutrients & CHNO elements	61%	4%	12%	23%
C	56%	1%	20%	23%
H	52%	1%	24%	23%
N	58%	0%	19%	23%
O	51%	1%	25%	23%
Ca	75%	6%	2%	18%
S	54%	1%	20%	25%
K	74%	6%	2%	19%
Mg	76%	6%	2%	16%
Na	67%	8%	4%	22%
Se	41%	8%	10%	41%
P	72%	4%	1%	22%
Energy (conversion) parameters	61%	4%	14%	20%
ash	57%	0%	23%	21%
LHV	58%	1%	17%	24%
HHV	55%	0%	27%	18%
Cl	43%	3%	9%	45%
F	70%	10%	11%	9%
Br	84%	11%	0%	5%

Table A5 (continued): Frequency of waste characterization approaches employed for the individual parameters and for the respective element group expressed as % of data points

Element	Direct chemical analysis	Mass balances	Secondary data reporting	Unreported methods
High-tech application elements	33%	63%	1%	3%
Sn	66%	14%	1%	19%
Ti	78%	14%	2%	6%
Ag	80%	7%	0%	13%
B	52%	0%	16%	32%
Sr	78%	22%	0%	0%
W	71%	18%	12%	0%
Nb	80%	20%	0%	0%
Sc	80%	20%	0%	0%
Y	80%	20%	0%	0%
Zr	80%	20%	0%	0%
Li	50%	50%	0%	0%
Au	75%	25%	0%	0%
Bi	0%	100%	0%	0%
Ga	0%	100%	0%	0%
Gd	0%	100%	0%	0%
Ge	0%	100%	0%	0%
Hf	0%	100%	0%	0%
In	0%	100%	0%	0%
Nd	0%	100%	0%	0%
Pr	0%	100%	0%	0%
Pt	0%	100%	0%	0%
Rb	0%	100%	0%	0%
Rh	0%	100%	0%	0%
Ru	0%	100%	0%	0%
Ta	0%	100%	0%	0%
Te	0%	100%	0%	0%

Table A6: Number of database entries from Africa

Parameter	Mixed organics	Food waste	Gardening waste	Paper and cardboard	Composites	Plastic	Combustibles	Metal	Glass	Inert	Mix	Total
Cd											15	15
Pb											5	5
Zn											15	15
N											15	15
C											3	3
Cu											15	15
Hg											9	9
ash											15	15
Cr											15	15
H												
S												
Ni											13	13
O												
As												
Cl												
HHV												
LHV												
Fe											15	15
Mn											15	15
P											12	12
Ca												
Al											3	3
Mg											12	12
K											12	12
Mo												
Na											12	12
F												
Co												
Sn											6	6
Sb											4	4
Be												
Ti												
V												
Ag												
Br												
K												
Ba												
Se												
Si												
B												
Sr												
Mg												
Ca											12	12
W												
Nb												
Sc												
Y												
Zr												
Li												
Au												
Cl												
P												
Tl												
Bi												
Ga												
Gd												
Ge												
Hf												
In												
Nd												
Pr												
Pt												
Rb												
Rh												
Ru												
Ta												
Te												

Table A7: Number of database entries from America-north

Parameter	Mixed organics	Food waste	Gardening waste	Paper and cardboard	Composites	Plastic	Combustibles	Metal	Glass	Inert	Mix	Total
Cd		3	2	6		5	5	5	1	1		28
Pb		3	4	9		8	7	5	2	2		40
Zn		4	4	12		8	7	6	1	2		44
N		7	9	6		7	6				21	56
C		7	9	6		7	6				21	56
Cu		4	7	12		8	7	6	1	2		47
Hg		2	2	12		8	7	6	2	2		41
ash		2	5	6		7	6				21	47
Cr		3	4	9		8	7	6	1	2		40
H		1	4	6		7	6				21	45
S		3	9	6		7	6				21	52
Ni		4	4	7		4	5	6	1	2		33
O		1	4	6		7	6				1	25
As		2	3	12		7	7	5	1	2		39
Cl		1	4	6		7	6				21	45
HHV		2	5	9		14	10				1	41
LHV											20	20
Fe		2	5									7
Mn		2	2									4
P		2	5									7
Ca		1	5									6
Al		2	2									4
Mg		2	2									4
K		2	5									7
Mo												
Na												
F												
Co												
Sn												
Sb												
Be												
Ti												
V												
Ag												
Br												
K												
Ba												
Se												
Si												
B		2	5									7
Sr												
Mg												
Ca												
W												
Nb												
Sc												
Y												
Zr												
Li												
Au												
Cl												
P												
Tl												
Bi												
Ga												
Gd												
Ge												
Hf												
In												
Nd												
Pr												
Pt												
Rb												
Rh												
Ru												
Ta												
Te												

Table A8: Number of database entries from America-south

Parameter	Mixed organics	Food waste	Gardening waste	Paper and cardboard	Composites	Plastic	Combustibles	Metal	Glass	Inert	Mix	Total
Cd												
Pb												
Zn												
N		1	1								4	6
C		1	1								4	6
Cu												
Hg												
ash		1	1								6	8
Cr												
H											4	4
S											3	3
Ni												
O												
As												
Cl												
HHV											4	4
LHV											4	4
Fe												
Mn												
P												
Ca												
Al												
Mg												
K												
Mo												
Na												
F												
Co												
Sn												
Sb												
Be												
Ti												
V												
Ag												
Br												
K												
Ba												
Se												
Si												
B												
Sr												
Mg												
Ca												
W												
Nb												
Sc												
Y												
Zr												
Li												
Au												
Cl												
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Bi												
Ga												
Gd												
Ge												
Hf												
In												
Nd												
Pr												
Pt												
Rb												
Rh												
Ru												
Ta												
Te												

Table A9: Number of database entries from Asia

Parameter	Mixed organics	Food waste	Gardening waste	Paper and cardboard	Composites	Plastic	Combustibles	Metal	Glass	Inert	Mix	Total
Cd	2	48		24		24	48	24	25	25	25	245
Pb	2	48		24		24	48	24	25	25	24	244
Zn	2	52	1	25		25	53	25	26	26	25	260
N		21	2	20		31	49	2	2	2	8	137
C		21	3	20		41	52	2	2	2	10	153
Cu	2	52	1	25		25	53	25	26	26	24	259
Hg	2	48		24		24	48	24	25	25	25	245
ash		23	1	21		25	47				6	123
Cr	2	48		24		24	48	24	25	25	25	245
H		20	2	20		57	50	2	2	2	9	164
S		19	2	18		31	45	2	2	2	9	130
Ni	2	48		24		24	48	24	25	25	25	245
O		20	2	25		33	50	2	2	2	8	144
As	2	48		24		24	48	24	24	24	25	243
Cl		6		4		19	10				6	45
HHV		9		11		19	27				7	73
LHV		6		7		18	22				6	59
Fe											1	1
Mn												
P											1	1
Ca											1	1
Al												
Mg												
K											1	1
Mo												
Na												
F												
Co												
Sn												
Sb												
Be												
Ti												
V												
Ag												
Br												
K												
Ba												
Se												
Si												
B												
Sr												
Mg												
Ca												
W												
Nb												
Sc												
Y												
Zr												
Li												
Au												
Cl												
P												
Tl												
Bi												
Ga												
Gd												
Ge												
Hf												
In												
Nd												
Pr												
Pt												
Rb												
Rh												
Ru												
Ta												
Te												

Table A10: Number of database entries from Europe

Parameter	Mixed organics	Food waste	Gardening waste	Paper and cardboard	Composites	Plastic	Combustibles	Metal	Glass	Inert	Mix	Total
Cd	32	47	17	36	10	35	59	30	15	17	31	329
Pb	31	48	17	33	9	31	54	27	14	16	31	311
Zn	28	51	17	31	10	28	50	25	11	13	30	294
N	74	56	19	38	17	36	47	6	7	10	14	324
C	51	56	19	37	17	35	43	7	8	10	25	308
Cu	28	49	16	27	8	21	45	21	11	14	24	264
Hg	19	47	16	34	10	31	53	23	14	16	30	293
ash	74	54	19	37	15	34	41	7	8	9	11	309
Cr	28	46	15	23	5	18	42	16	13	16	20	242
H	49	50	19	36	15	33	37	7	7	8	14	275
S	57	51	16	31	16	30	49	9	8	11	25	303
Ni	24	44	15	20	5	13	37	11	10	13	19	211
O	6	50	19	33	14	31	33	6	6	7	11	216
As	24	4	15	21	3	15	34	16	11	13	13	169
Cl	51	8	18	40	19	38	60	17	9	12	29	301
HHV	49	8	9	24	13	24	26	2	3	4	11	173
LHV	46	10	15	36	17	33	40	7	7	10	13	234
Fe	22	48	15	17	4	11	31	10	8	11	18	195
Mn	22	46	15	17	4	11	31	10	8	11	13	188
P	56	7	15	15	4	9	23	6	6	9	11	161
Ca	14	43	15	15	4	9	23	6	6	9	14	158
Al	20	43	14	15	2	7	21	10	7	8	11	158
Mg	10	47	15	14	2	7	17	6	5	7	8	138
K	15	6	14	14	4	7	20	6	6	8	11	111
Mo	12	43	14	15	2	7	21	10	7	8	7	146
Na	6	7	15	15	4	9	23	6	6	9	12	112
F	1	4	14	20	6	13	22	15	5	7	14	121
Co	12	42	13	5		5	14	5	3	4	10	113
Sn	10	2	13	6	2	7	20	5	4	6	14	89
Sb	9	2	13	5		5	14	5	3	4	10	70
Be	9	2	13	5		5	14	3	3	4	4	62
Ti	9	1	12	4		3	10	5	3	3	5	55
V	16	1	12	2		2	8	4	2	2	5	54
Ag	9	1		4		3	10	5	3	3	4	42
Br	9	1		4		3	10	2	2	2	8	41
K	40											40
Ba	1	1	13	3		3	6	1	1	2	6	37
Se	5	1		3	1	3	7	3	2	2	5	32
Si	1		12	2		1	3	1	1	1	10	32
B	1			2		1	2	1	1	1	3	12
Sr	1		12	2		1	2	1	1	1	2	23
Mg	2			1	2	2	6		1	2	3	19
Ca	1	4										5
W			12								1	13
Nb			12								1	13
Sc			12								1	13
Y			12								1	13
Zr			12								1	13
Li	1			2		1	2	1	1	1	3	12
Au	1			2		1	2	1	1	1	1	10
Cl	4			1		1	4					10
P	4			1		1	4					10
Tl											1	1
Bi											1	1
Ga											1	1
Gd											1	1
Ge											1	1
Hf											1	1
In											1	1
Nd											1	1
Pr											1	1
Pt											1	1
Rb											1	1
Rh											1	1
Ru											1	1
Ta											1	1
Te											1	1

Table A11: Number of database entries from Middle East

Parameter	Mixed organics	Food waste	Gardening waste	Paper and cardboard	Composites	Plastic	Combustibles	Metal	Glass	Inert	Mix	Total
Cd											6	6
Pb											6	6
Zn			1									1
N		1	1								4	6
C											4	4
Cu			1									1
Hg												
ash		1		1		1						3
Cr											6	6
H												
S			1									1
Ni											6	6
O												
As												
Cl												
HHV		3	1	3		3	4				3	17
LHV												
Fe			1									1
Mn												
P		1	2								4	7
Ca												
Al												
Mg												
K		1	2								10	13
Mo												
Na											6	6
F												
Co												
Sn												
Sb												
Be												
Ti												
V												
Ag												
Br												
K												
Ba												
Se												
Si												
B												
Sr												
Mg												
Ca												
W												
Nb												
Sc												
Y												
Zr												
Li												
Au												
Cl												
P												
Tl												
Bi												
Ga												
Gd												
Ge												
Hf												
In												
Nd												
Pr												
Pt												
Rb												
Rh												
Ru												
Ta												
Te												

Table A12: Number of database entries from secondary data reporting

Parameter	Mixed organics	Food waste	Gardening waste	Paper and cardboard	Composites	Plastic	Combustibles	Metal	Glass	Inert	Mix	Total
Cd	3			3		5	11	1	1	2	2	28
Pb	3			3		5	11	1	1	3	2	29
Zn	2	1	1	4		2	2			2	1	15
N		8	7	10	1	5	19	5	2	4	4	65
C		8	7	10	1	9	20	5	2	4	4	70
Cu		1	1	2							1	5
Hg	1			1		3	5	1	1	1	2	15
ash		11	8	12	2	13	21	8	2	5	5	87
Cr	3			3		5	7	1	1	3	2	25
H		8	7	10	1	9	20	5	2	4	4	70
S		8	7	10	1	4	17	2	2	1	4	56
Ni		1	1								1	3
O		8	7	10	1	8	16	5	2	4	4	65
As											1	1
Cl		1	2	1		5	3	2	1	1	1	17
HHV		5	4	9	1	9	6	3		2	5	44
LHV		1	2	1		1	3	2	1	1		12
Fe		1	1	2							1	5
Mn		1	1	2							1	5
P		1	1	2								4
Ca		1	1	2								4
Al							1					1
Mg		1	1	2								4
K		1	1	2								4
Mo		1	1									2
Na		1	1	2			1					5
F		1	2	1		1	3	2	1	1		12
Co		1	1									2
Sn											1	1
Sb	1			1		3	3	1	1	1	1	12
Be												
Ti											1	1
V												
Ag												
Br												
K												
Ba												
Se		1	1								1	3
Si												
B		1	1	2								4
Sr												
Mg												
Ca												
W		1	1									2
Nb												
Sc												
Y												
Zr												
Li												
Au												
Cl												
P												
Tl											1	1
Bi												
Ga												
Gd												
Ge												
Hf												
In												
Nd												
Pr												
Pt												
Rb												
Rh												
Ru												
Ta												
Te												

Table A13: Number of database entries from unknown regional origin

Parameter	Mixed organics	Food waste	Gardening waste	Paper and cardboard	Composites	Plastic	Combustibles	Metal	Glass	Inert	Mix	Total
Cd	1			3	1	10	5	1	1	1	1	24
Pb	1			3	1	10	5	1	1	1	1	24
Zn	1	1		3	1	2	4	1	1	1	1	16
N	1			4		3	1				1	10
C	1			4		3	1				1	10
Cu	1	1		3	1	2	4	1	1	1	1	16
Hg												
ash	1			1		1	1				2	6
Cr	1			2	1	10	4	1	1	1	1	22
H	1			4		3	1				1	10
S	1			4		3	1				1	10
Ni	1			3	1	2	4	1	1	1	1	15
O	1			4		3	1				1	10
As												
Cl	1			1		2	1				1	6
HHV	2			2		2	2	1	1	1	2	13
LHV		1	1	2		2	2	2	1	1		12
Fe		1		1								2
Mn		1		1								2
P												
Ca												
Al												
Mg												
K												
Mo												
Na												
F												
Co				1								1
Sn												
Sb												
Be												
Ti												
V												
Ag												
Br												
K												
Ba												
Se												
Si												
B												
Sr												
Mg												
Ca												
W												
Nb												
Sc												
Y												
Zr												
Li												
Au												
Cl												
P												
Tl												
Bi												
Ga												
Gd												
Ge												
Hf												
In												
Nd												
Pr												
Pt												
Rb												
Rh												
Ru												
Ta												
Te												

Appendix B

for

Physico-chemical characterisation of material fractions in household waste: overview of data in literature

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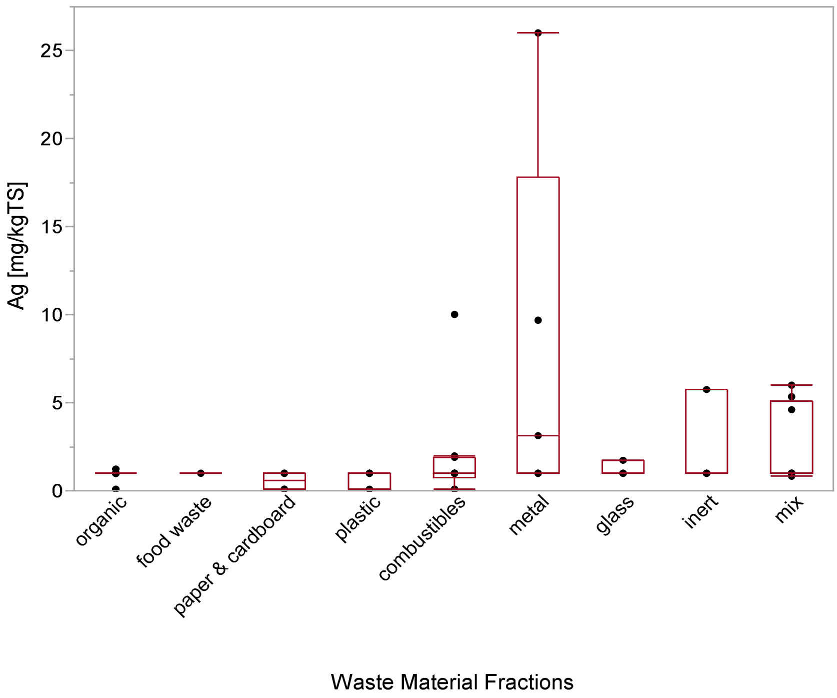
Quantiles for each parameter (in alphabetical order)

Value ranges for Ag



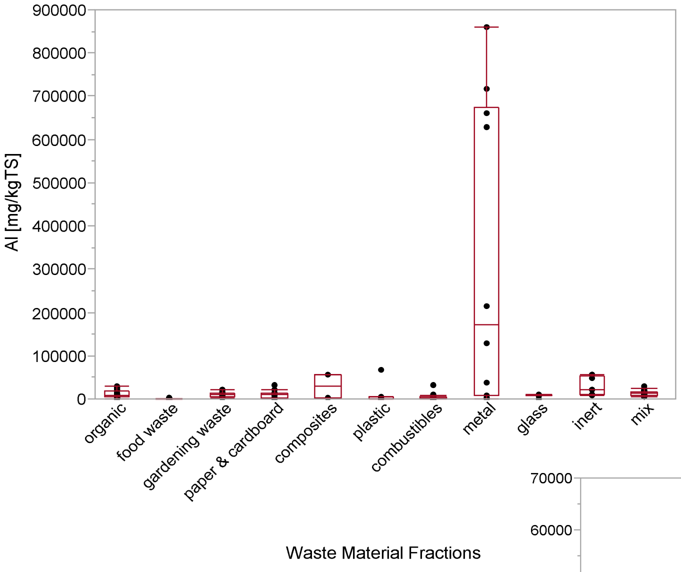
Quantiles [mg/kgTS]

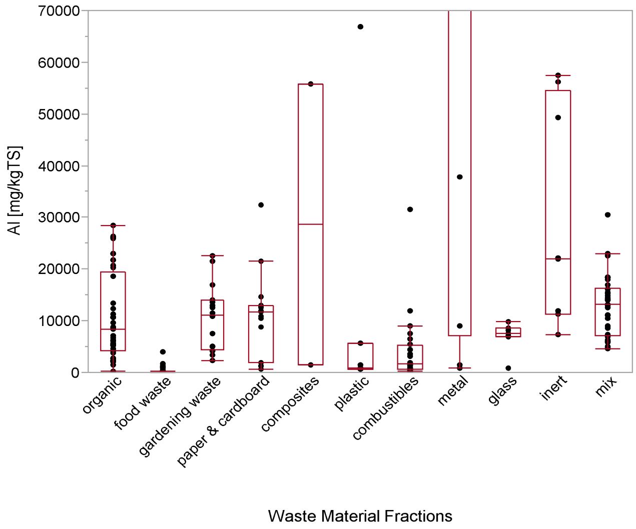
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	7	0.08	0.08	1.00	1.00	1.00	1.20	1.20
food waste	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	4	3	0.08	0.08	0.09	0.56	1.00	1.00	1.00
composites	-	-	-	-	-	-	-	-	-
plastic	3	3	0.08	0.08	0.08	1.00	1.00	1.00	1.00
combustibles	10	7	0.08	0.08	0.77	1.00	1.93	9.20	10.00
metal	5	4	1.00	1.00	1.00	3.14	17.85	26.00	26.00
glass	3	2	1.00	1.00	1.00	1.00	1.71	1.71	1.71
inert	3	2	1.00	1.00	1.00	1.00	5.78	5.78	5.78
mix	8	4	0.86	0.86	1.00	1.00	5.12	6.02	6.02
Total	46	33							

*) number of data points

**) number of values below the detection limit

Value ranges for Al



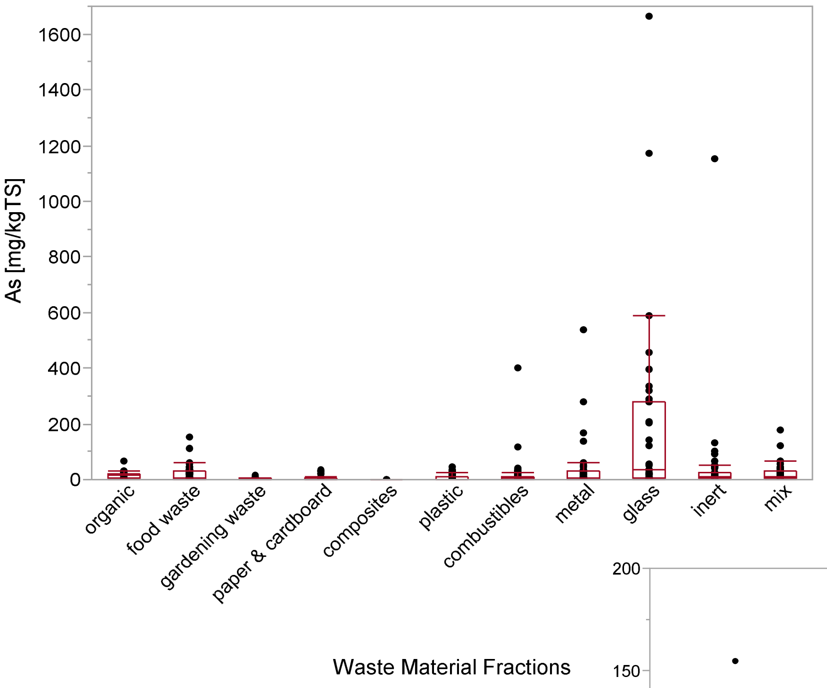


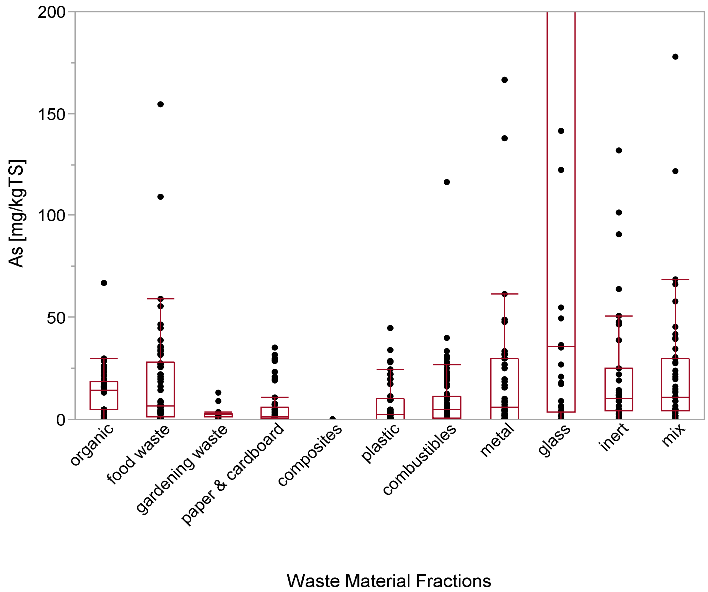
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	41	-	286	2160	4100	8400	19464	25412	28333
food waste	47	-	12	21	30	46	103	851	3890
gardening waste	16	-	2360	3088	4453	11178	13916	21859	22550
paper & cardboard	15	-	681	1033	1800	11700	12933	25870	32425
composites	2	-	1430	1430	1430	28615	55800	55800	55800
plastic	7	-	692	692	720	820	5650	66800	66800
combustibles	24	-	200	250	678	1570	5150	10500	31600
metal	10	-	860	926	7055	171500	674500	846700	861000
glass	7	-	750	750	6860	7620	8470	9870	9870
inert	8	-	7300	7300	11361	22000	54483	57500	57500
mix	34	-	4670	5435	7118	13080	16280	20478	30500
Grand Total	209	-							

*) number of data points
**) number of values below the detection limit

Value ranges for As





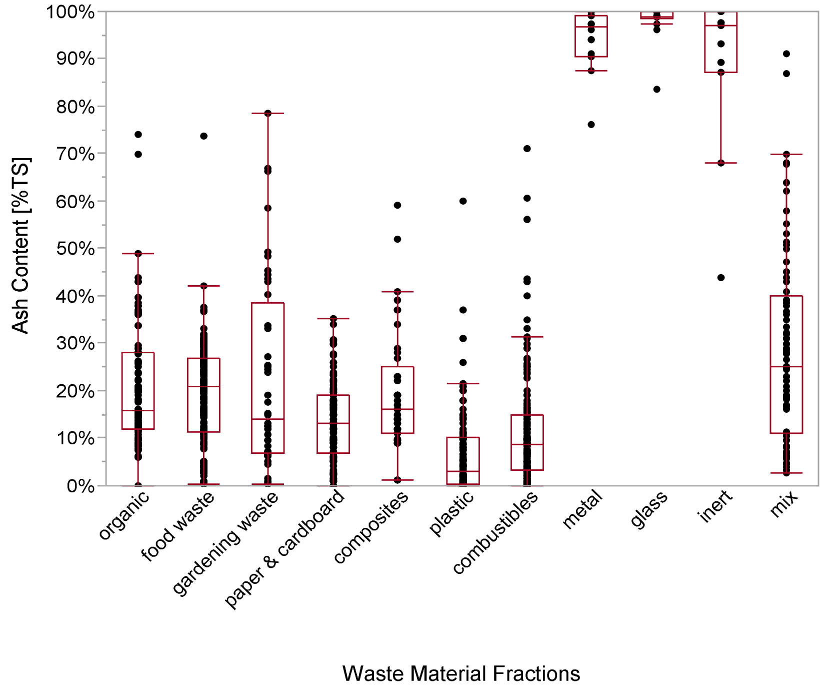
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	48	8	0.200	0.699	5.000	14.565	18.605	26.385	67.000
food waste	54	1	0.000	0.000	1.000	6.750	28.350	45.550	154.400
gardening waste	18	-	0.000	0.495	1.188	2.405	3.080	9.582	13.020
paper & cardboard	57	4	0.000	0.126	0.345	1.090	6.100	24.100	35.100
composites	3	-	0.140	0.140	0.140	0.200	0.200	0.200	0.200
plastic	46	5	0.000	0.000	0.215	2.250	10.075	25.580	44.800
combustibles	89	10	0.000	0.000	0.305	5.000	11.340	28.170	400.000
metal	45	1	0.000	0.000	0.000	6.200	29.800	92.040	539.000
glass	36	-	0.000	0.000	3.800	35.900	280.475	497.680	1664.400
inert	39	2	0.000	0.000	4.000	10.400	25.000	91.000	1153.000
mix	50	2	0.000	1.633	4.060	10.950	30.068	56.465	177.990
Grand Total	485	33							

*) number of data points

**) number of values below the detection limit

Value ranges for Ash Content



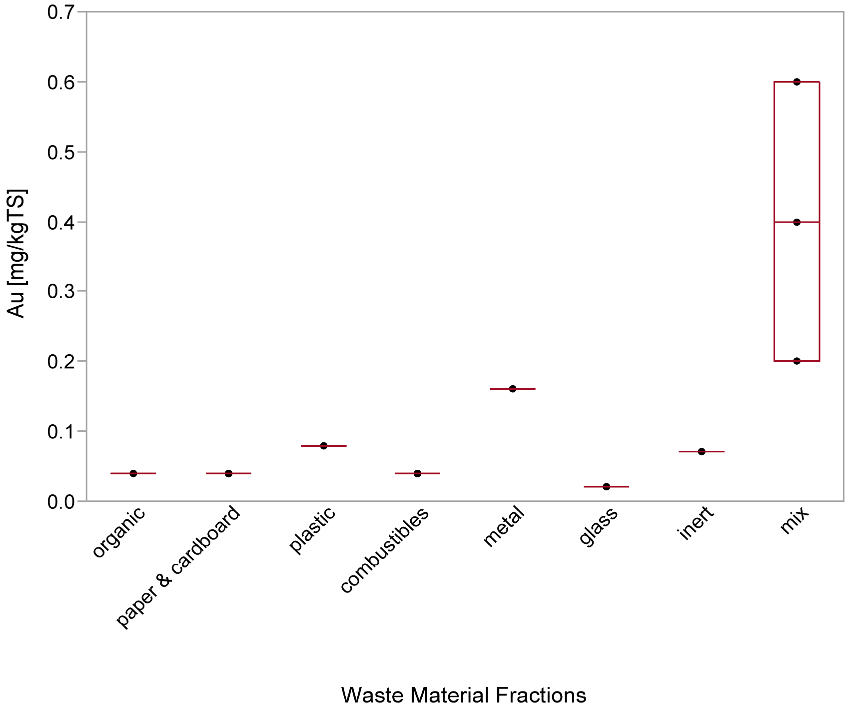
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	106	-	0.0%	8.5%	12.0%	15.7%	28.0%	38.0%	74.0%
food waste	196	-	0.2%	3.8%	11.5%	20.9%	26.9%	30.0%	73.7%
gardening waste	44	-	0.4%	3.0%	6.8%	14.0%	38.6%	53.9%	78.4%
paper & cardboard	112	-	0.0%	2.4%	6.8%	13.0%	19.0%	25.7%	35.4%
composites	41	-	1.2%	9.0%	11.0%	16.0%	25.0%	38.6%	59.0%
plastic	119	-	0.0%	0.1%	0.4%	3.0%	10.0%	18.0%	60.0%
combustibles	146	-	0.0%	1.0%	3.2%	8.7%	15.1%	26.6%	71.0%
metal	18	-	76.1%	86.5%	90.5%	96.7%	99.3%	100.0%	100.0%
glass	14	-	83.5%	89.8%	98.5%	98.9%	100.0%	100.0%	100.0%
inert	11	-	43.9%	48.7%	87.2%	97.0%	100.0%	100.0%	100.0%
mix	85	-	2.6%	6.1%	11.0%	25.0%	39.9%	62.8%	91.0%
Total	892	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Au



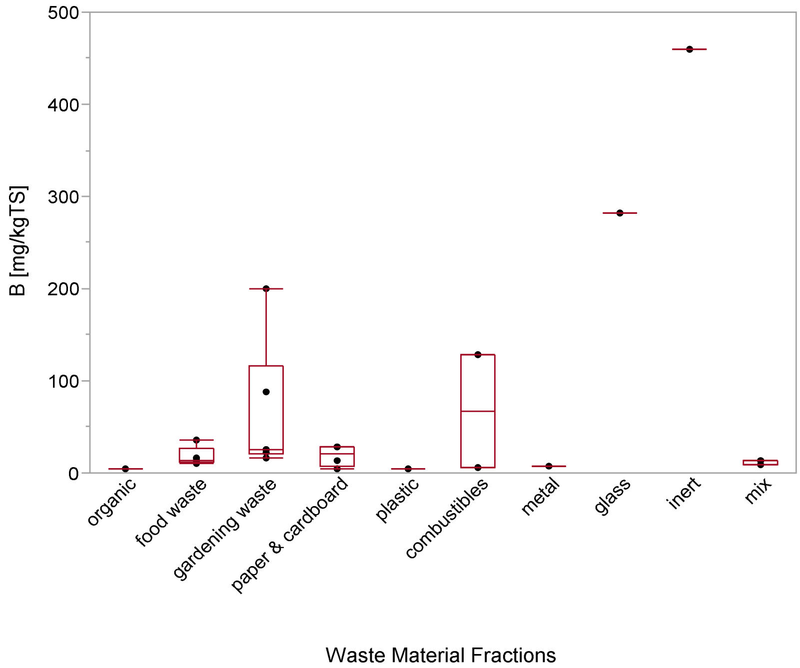
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	1	0.04	0.04	0.04	0.04	0.04	0.04	0.04
food waste	-	-	-	-	-	-	-	-	-
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	2	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04
composites	-	-	-	-	-	-	-	-	-
plastic	1	1	0.08	0.08	0.08	0.08	0.08	0.08	0.08
combustibles	2	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04
metal	1	-	0.16	0.16	0.16	0.16	0.16	0.16	0.16
glass	1	1	0.02	0.02	0.02	0.02	0.02	0.02	0.02
inert	1	-	0.07	0.07	0.07	0.07	0.07	0.07	0.07
mix	3	-	0.20	0.20	0.20	0.40	0.60	0.60	0.60
Grand Total	12	7							

*) number of data points

**) number of values below the detection limit

Value ranges for B



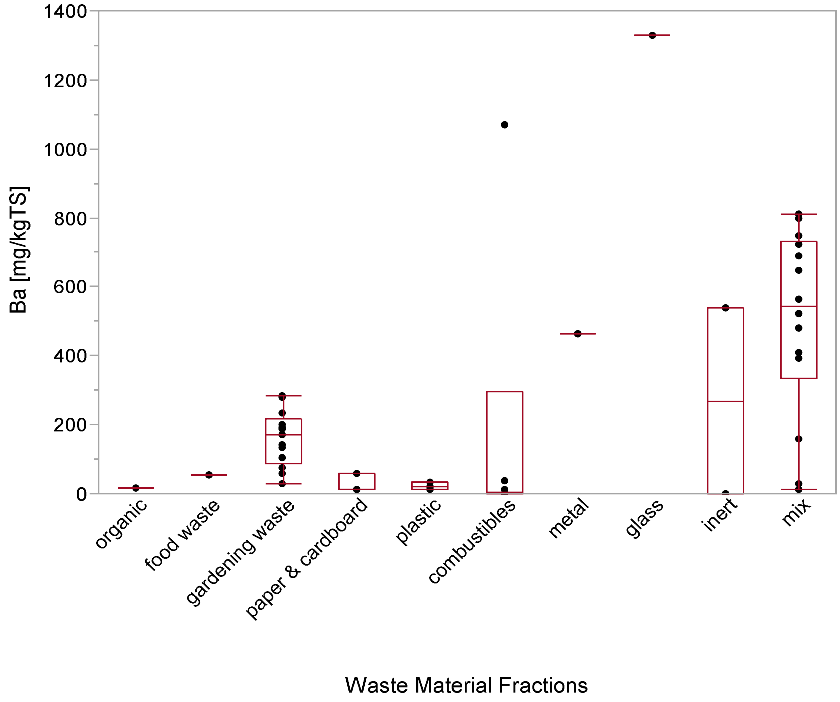
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	-	5.1	5.1	5.1	5.1	5.1	5.1	5.1
food waste	5	-	11.0	11.0	11.5	13.0	26.5	36.0	36.0
gardening waste	6	-	17.0	17.0	20.8	25.5	116.0	200.0	200.0
paper & cardboard	4	-	4.6	4.6	6.9	21.0	28.5	28.7	28.7
composites	-	-	-	-	-	-	-	-	-
plastic	1	-	4.1	4.1	4.1	4.1	4.1	4.1	4.1
combustibles	2	-	5.6	5.6	5.6	66.8	128.0	128.0	128.0
metal	1	-	7.4	7.4	7.4	7.4	7.4	7.4	7.4
glass	1	-	282.0	282.0	282.0	282.0	282.0	282.0	282.0
inert	1	-	459.0	459.0	459.0	459.0	459.0	459.0	459.0
mix	3	-	8.6	8.6	8.6	14.0	14.0	14.0	14.0
Grand Total	25	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Ba



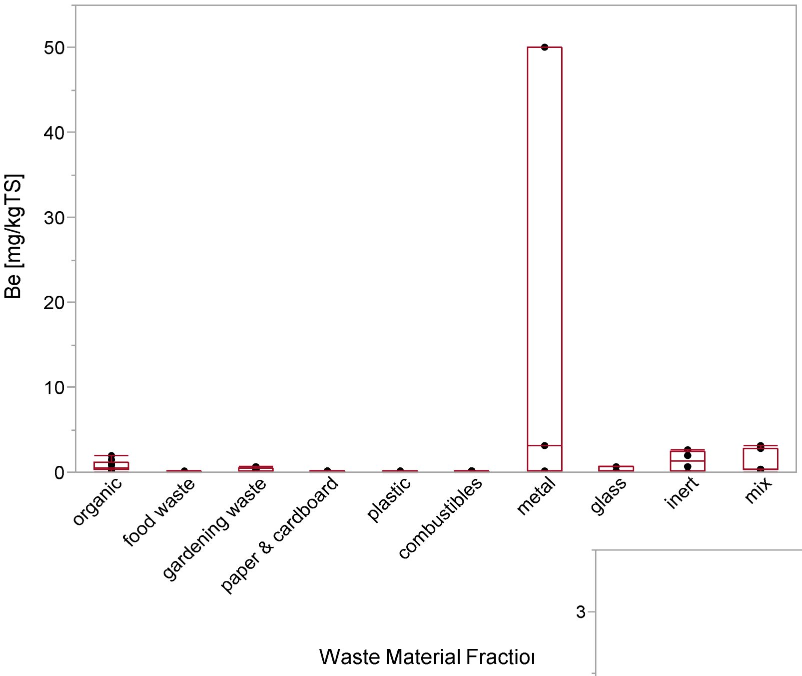
Quantiles [mg/kgTS]

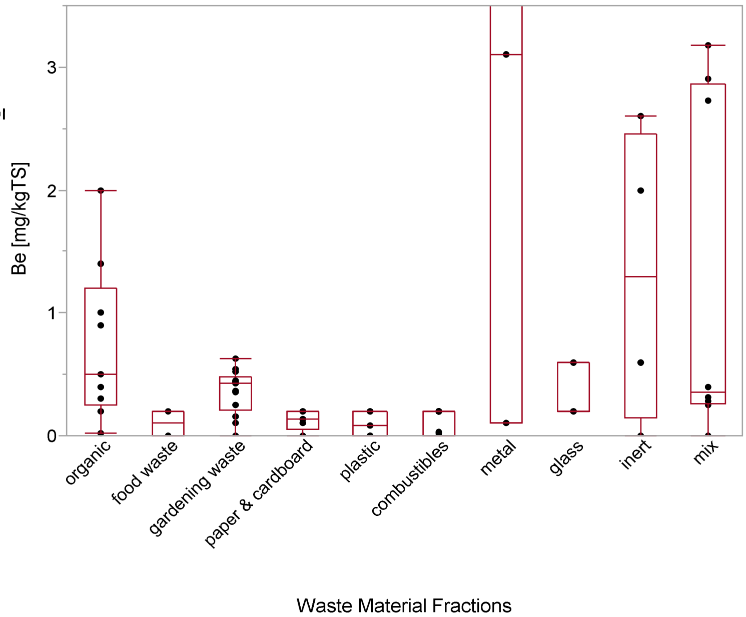
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	-	18.1	18.1	18.1	18.1	18.1	18.1	18.1
food waste	1	-	55.1	55.1	55.1	55.1	55.1	55.1	55.1
gardening waste	13	-	27.8	39.5	89.1	170.2	216.1	282.7	283.3
paper & cardboard	3	-	12.3	12.3	12.3	12.5	60.1	60.1	60.1
composites	-	-	-	-	-	-	-	-	-
plastic	3	-	12.8	12.8	12.8	22.5	33.4	33.4	33.4
combustibles	6	-	0.0	0.0	0.0	5.3	297.5	1071.0	1071.0
metal	1	-	464.0	464.0	464.0	464.0	464.0	464.0	464.0
glass	1	-	1330.0	1330.0	1330.0	1330.0	1330.0	1330.0	1330.0
inert	2	-	0.0	0.0	0.0	269.5	539.0	539.0	539.0
mix	14	-	13.6	21.0	335.8	543.5	730.0	804.5	809.0
Grand Total	45	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Be





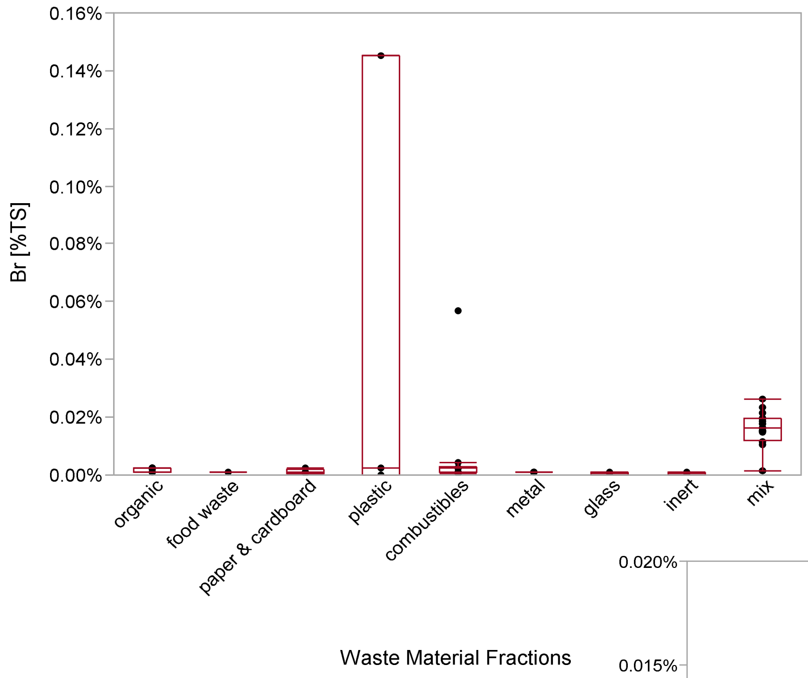
Quantiles [mg/kgTS]

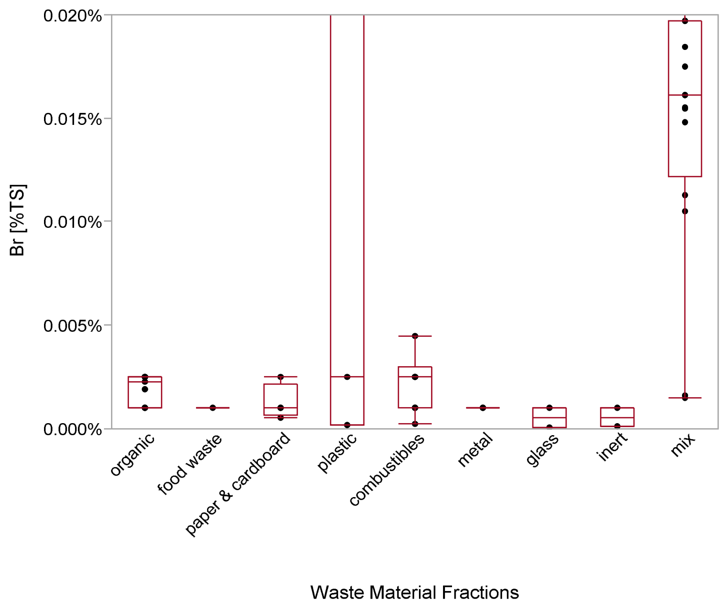
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	1	0.02	0.02	0.25	0.50	1.20	2.00	2.00
food waste	2	-	0.00	0.00	0.00	0.10	0.20	0.20	0.20
gardening waste	13	-	0.00	0.04	0.21	0.43	0.49	0.59	0.63
paper & cardboard	5	-	0.00	0.00	0.05	0.14	0.20	0.20	0.20
composites	-	-	-	-	-	-	-	-	-
plastic	5	1	0.00	0.00	0.00	0.08	0.20	0.20	0.20
combustibles	14		0.00	0.00	0.00	0.20	0.20	0.20	0.20
metal	3	1	0.10	0.10	0.10	3.10	50.00	50.00	50.00
glass	3	-	0.20	0.20	0.20	0.20	0.60	0.60	0.60
inert	4	-	0.00	0.00	0.15	1.30	2.45	2.60	2.60
mix	8	-	0.00	0.00	0.26	0.36	2.86	3.18	3.18
Grand Total	66	3							

*) number of data points

**) number of values below the detection limit

Value ranges for Br





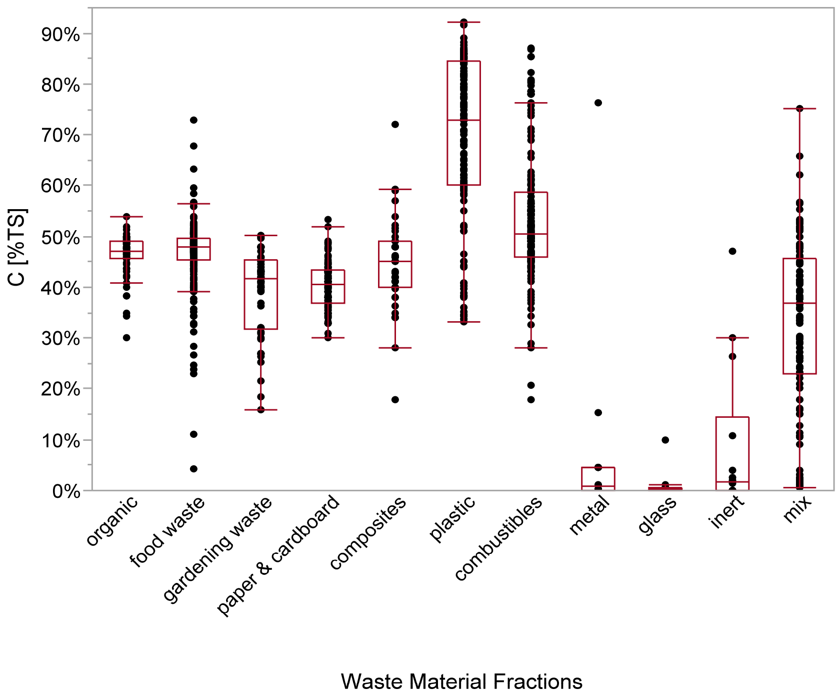
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	7	0.001%	0.001%	0.001%	0.002%	0.003%	0.003%	0.003%
food waste	1	1	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	4	2	0.001%	0.001%	0.001%	0.001%	0.002%	0.003%	0.003%
composites	-	-	-	-	-	-	-	-	-
plastic	3	1	0.000%	0.000%	0.000%	0.003%	0.145%	0.145%	0.145%
combustibles	10	7	0.000%	0.000%	0.001%	0.003%	0.003%	0.052%	0.057%
metal	2	2	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
glass	2	2	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%
inert	2	1	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%
mix	16	1	0.002%	0.002%	0.012%	0.016%	0.020%	0.024%	0.026%
Total	49	24							

*) number of data points

**) number of values below the detection limit

Value ranges for C



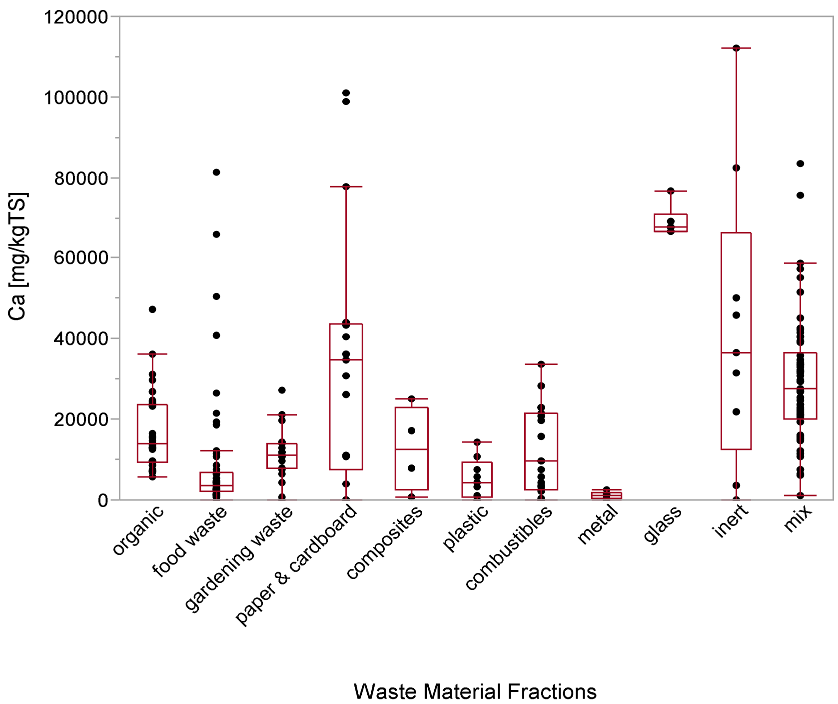
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	61	-	30.0%	40.2%	45.6%	47.2%	49.0%	50.0%	54.0%
food waste	211	-	4.4%	39.5%	45.2%	47.9%	49.8%	51.6%	73.0%
gardening waste	49	-	15.8%	26.5%	31.7%	41.8%	45.5%	47.8%	50.1%
paper & cardboard	113	-	30.2%	34.4%	37.0%	40.5%	43.3%	46.2%	53.4%
composites	42	-	18.0%	34.0%	39.9%	45.0%	49.0%	56.1%	72.0%
plastic	137	-	33.3%	40.7%	60.0%	73.0%	84.5%	86.1%	92.1%
combustibles	152	-	18.0%	42.6%	46.1%	50.5%	58.6%	76.2%	87.1%
metal	14	-	0.0%	0.0%	0.0%	0.8%	4.5%	45.7%	76.2%
glass	14	-	0.0%	0.0%	0.0%	0.4%	0.5%	5.5%	9.8%
inert	14	-	0.0%	0.0%	0.0%	1.6%	14.6%	38.6%	47.1%
mix	104	-	0.6%	3.5%	23.0%	36.8%	45.8%	52.2%	75.2%
Grand Total	911	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Ca



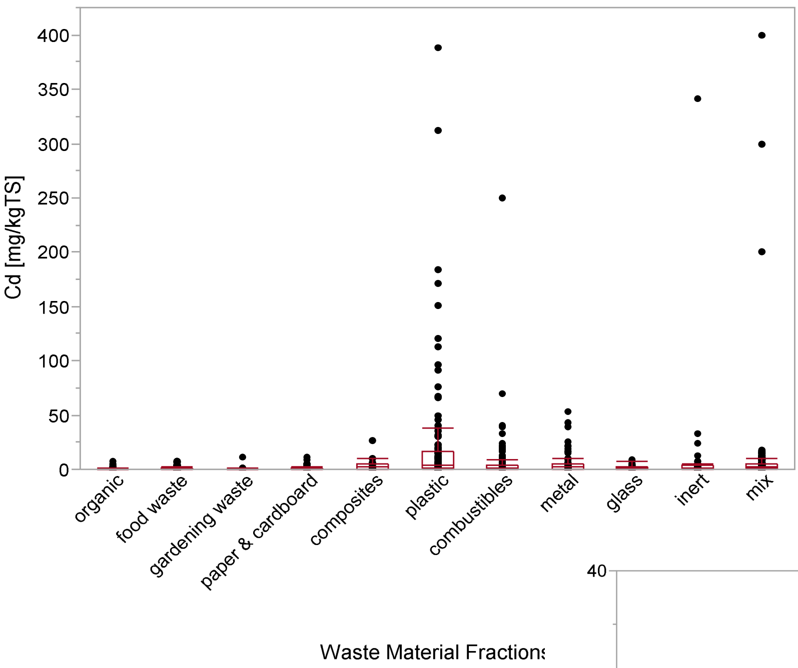
Quantiles [mg/kgTS]

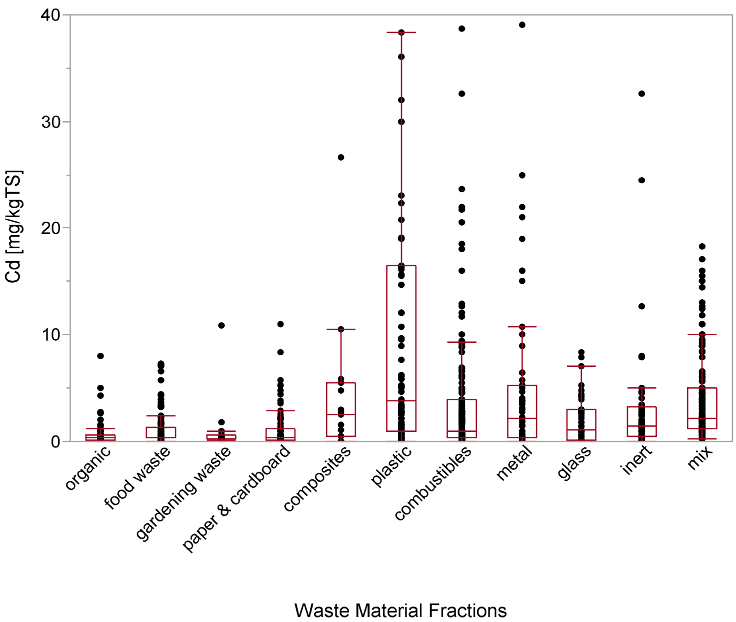
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	38	-	5700	7180	9475	14000	23750	29850	47313
food waste	57	-	0	1156	1977	3611	6709	22553	81250
gardening waste	21	-	0	1306	7750	11256	14149	20838	27100
paper & cardboard	17	-	0	0	7415	34600	43600	99160	101000
composites	4	-	727	727	2500	12555	23080	25010	25010
plastic	9	-	21.5	22	577	4160	9270	14260	14260
combustibles	23	-	45.7	51	2390	9510	21522	26140	33770
metal	6	-	36	36	192	1143	1728	2410	2410
glass	6	-	66730	66730	66783	67775	70900	76600	76600
inert	9	-	0	0	12675	36400	66303	112110	112110
mix	62	-	1228.6	10950	20075	27500	36675	49640	83550
Grand Total	252	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Cd





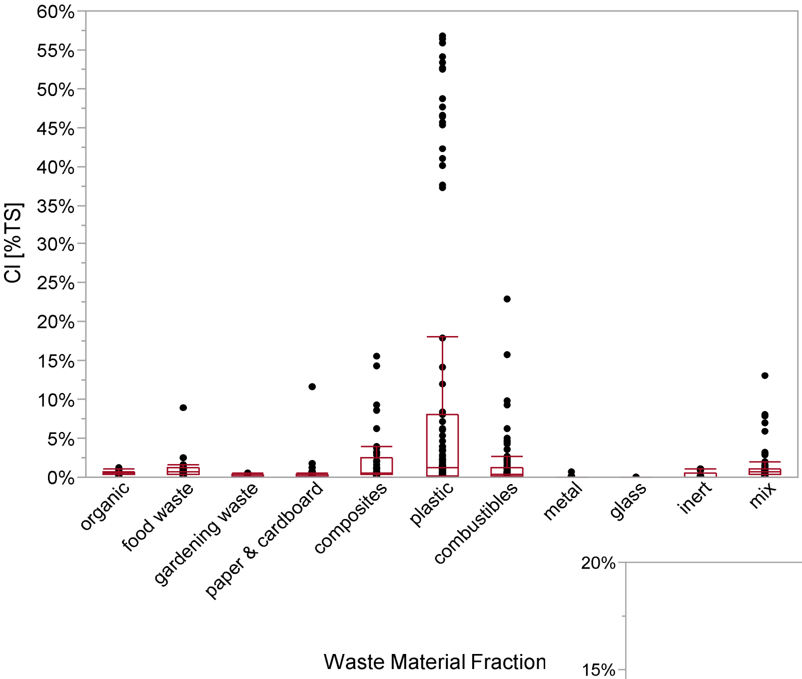
Quantiles [mg/kgTS]

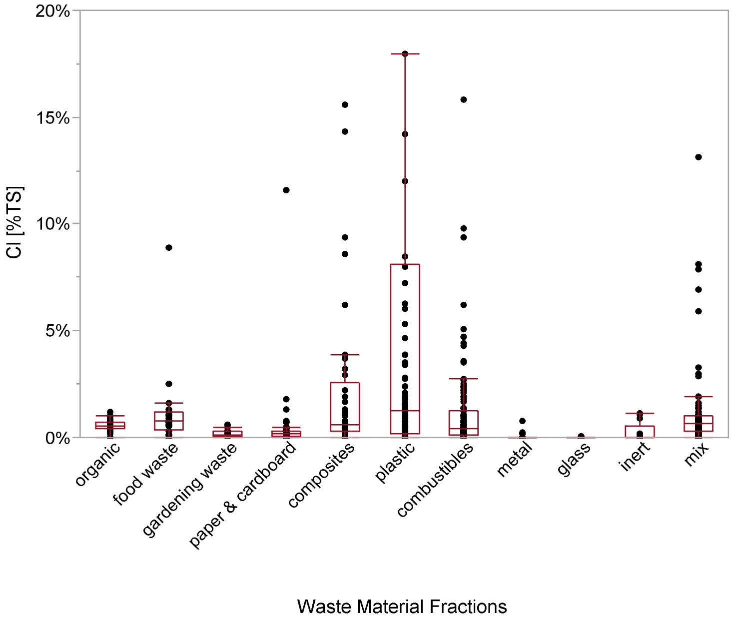
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	71	5	0.00	0.08	0.15	0.35	0.60	1.56	7.95
food waste	100	42	0.00	0.10	0.40	0.40	1.28	3.49	7.30
gardening waste	23	-	0.11	0.16	0.20	0.25	0.60	1.48	10.85
paper & cardboard	88	4	0.00	0.00	0.09	0.30	1.25	3.62	11.00
composites	15	-	0.00	0.01	0.50	2.52	5.50	16.94	26.60
plastic	103	2	0.00	0.20	0.90	3.80	16.50	72.68	388.00
combustibles	158	3	0.00	0.00	0.30	1.00	3.93	11.73	250.00
metal	71	5	0.00	0.00	0.30	2.10	5.20	18.40	53.00
glass	49	4	0.00	0.00	0.15	1.10	2.95	4.80	8.40
inert	50	-	0.00	0.00	0.50	1.45	3.28	7.99	341.00
mix	141	-	0.20	0.76	1.25	2.17	5.04	11.67	400.00
Grand Total	869	65							

*) number of data points

**) number of values below the detection limit

Value ranges for Cl





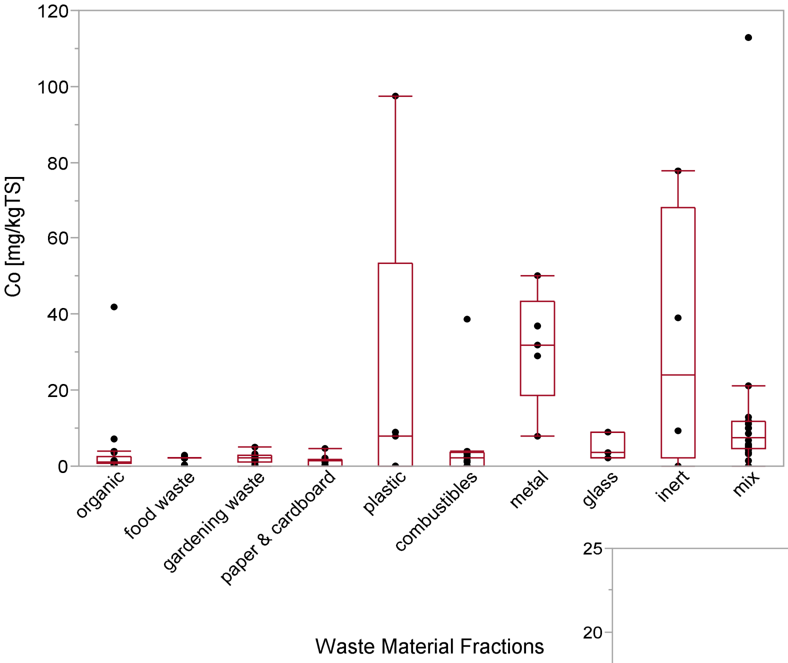
Quantiles [%TS]

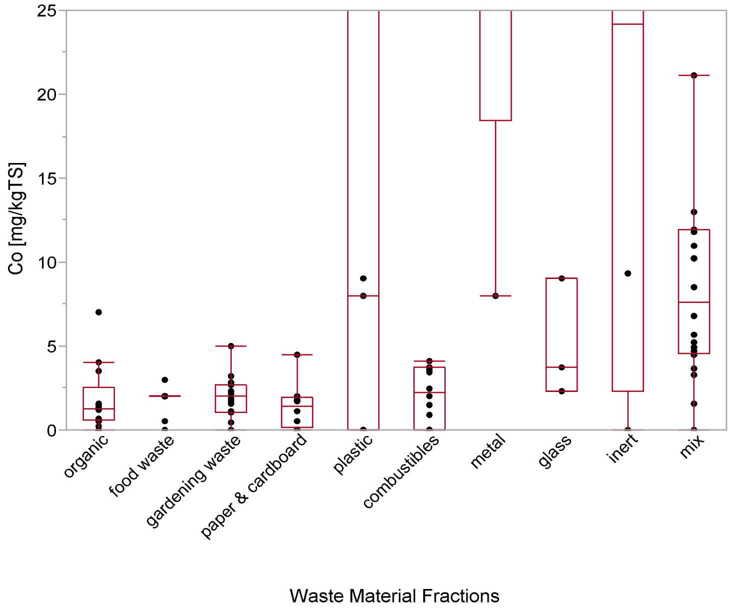
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	58	-	0.001%	0.165%	0.400%	0.532%	0.700%	0.806%	1.200%
food waste	20	-	0.000%	0.012%	0.365%	0.765%	1.173%	2.413%	8.900%
gardening waste	26	-	0.000%	0.047%	0.078%	0.110%	0.283%	0.530%	0.600%
paper & cardboard	75	-	0.000%	0.001%	0.070%	0.160%	0.300%	0.500%	11.600%
composites	41	-	0.000%	0.000%	0.300%	0.600%	2.550%	8.120%	15.600%
plastic	90	-	0.000%	0.000%	0.200%	1.250%	8.125%	47.605%	56.800%
combustibles	114	-	0.000%	0.000%	0.100%	0.400%	1.248%	3.550%	23.000%
metal	19	-	0.000%	0.000%	0.000%	0.000%	0.001%	0.240%	0.760%
glass	10	-	0.000%	0.000%	0.000%	0.000%	0.000%	0.054%	0.060%
inert	13	-	0.000%	0.000%	0.000%	0.020%	0.550%	1.094%	1.110%
mix	81	-	0.000%	0.104%	0.305%	0.670%	1.000%	2.692%	13.160%
Total	547	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Co





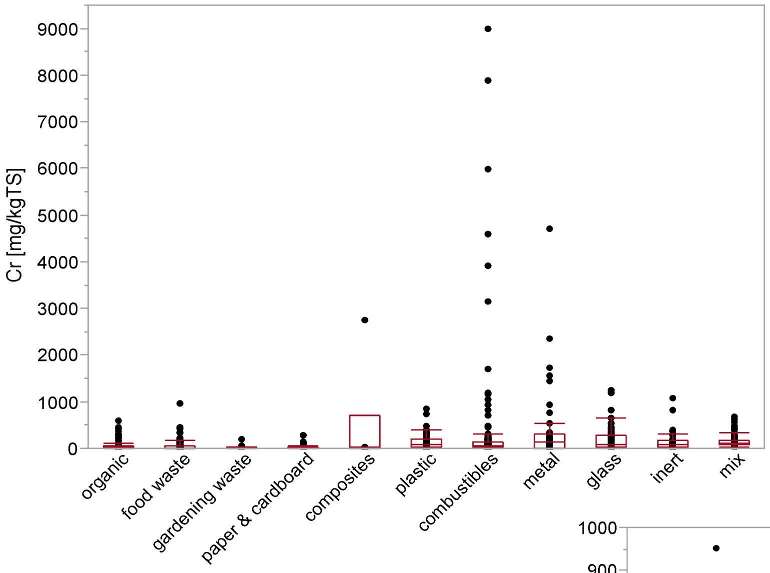
Quantiles [mg/kgTS]

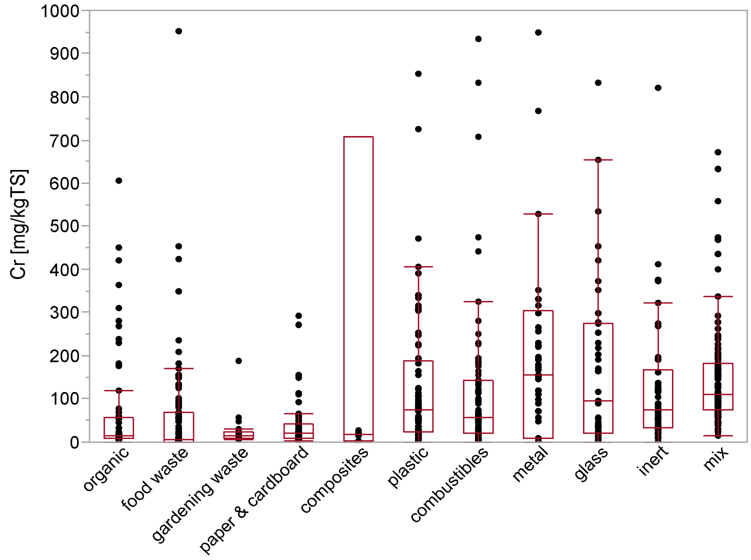
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	17	1	0.0	0.2	0.6	1.3	2.6	14.0	42.0
food waste	43	41	0.0	2.0	2.0	2.0	2.0	2.0	3.0
gardening waste	14	-	0.0	0.2	1.1	2.0	2.7	4.1	5.0
paper & cardboard	8	1	0.0	0.0	0.1	1.4	2.0	4.5	4.5
composites	-	-	-	-	-	-	-	-	-
plastic	5	-	0.0	0.0	0.0	8.0	53.3	97.6	97.6
combustibles	14	-	0.0	0.0	0.0	2.3	3.7	21.4	38.7
metal	5	-	8.0	8.0	18.5	32.0	43.5	50.0	50.0
glass	3	-	2.3	2.3	2.3	3.7	9.0	9.0	9.0
inert	4	-	0.0	0.0	2.3	24.2	68.0	77.7	77.7
mix	20	-	0.0	1.8	4.5	7.6	11.9	103.8	113.0
Grand Total	133	43							

*) number of data points

**) number of values below the detection limit

Value ranges for Cr





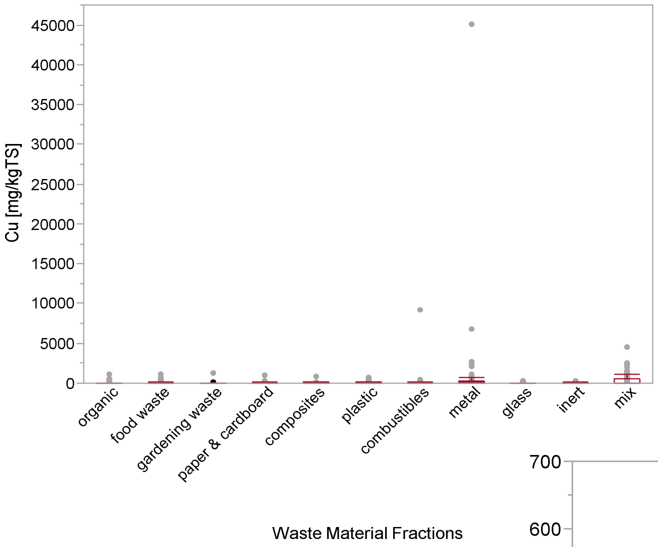
Quantiles [mg/kgTS]

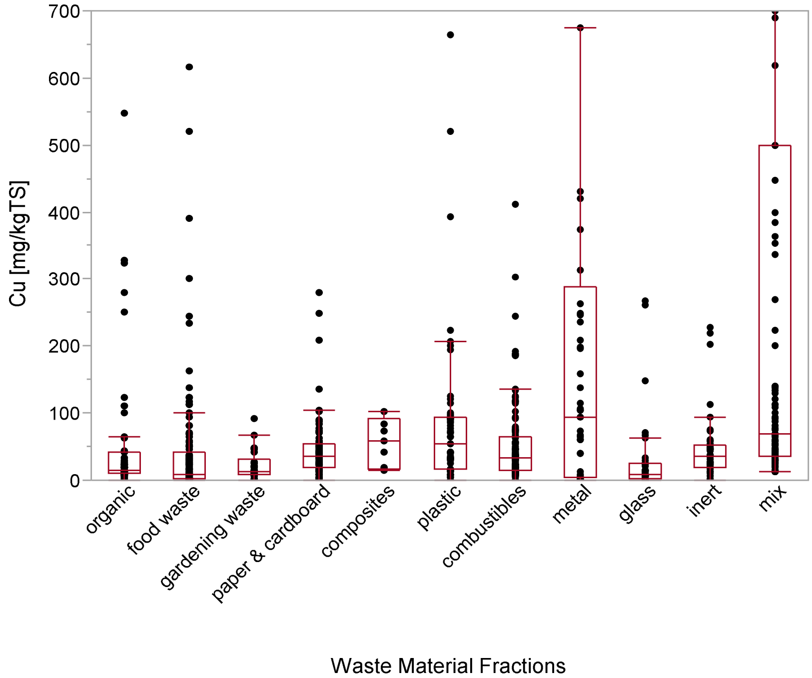
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	62	-	1.3	6.2	8.4	14.8	56.3	277.0	607.0
food waste	103	17	0.0	1.0	1.1	5.2	69.0	155.3	951.5
gardening waste	19	1	4.5	8.0	8.7	16.2	23.0	55.5	188.7
paper & cardboard	65	-	2.5	5.4	8.8	20.0	40.3	99.4	291.8
composites	6	-	1.0	1.0	2.4	18.5	708.5	2750.0	2750.0
plastic	73	-	0.4	9.7	25.4	73.9	187.0	338.4	853.0
combustibles	122	-	0.0	6.2	19.8	56.4	142.2	795.3	9000.0
metal	50	-	0.0	0.0	9.2	154.5	304.3	1387.0	4702.0
glass	49	-	0.0	0.0	21.6	95.3	275.7	534.0	1236.8
inert	50	-	0.0	13.4	34.0	74.3	167.5	377.1	1075.5
mix	116	-	16.0	53.0	74.8	111.8	182.3	277.1	671.1
Grand Total	715	18							

*) number of data points

**) number of values below the detection limit

Value ranges for Cu





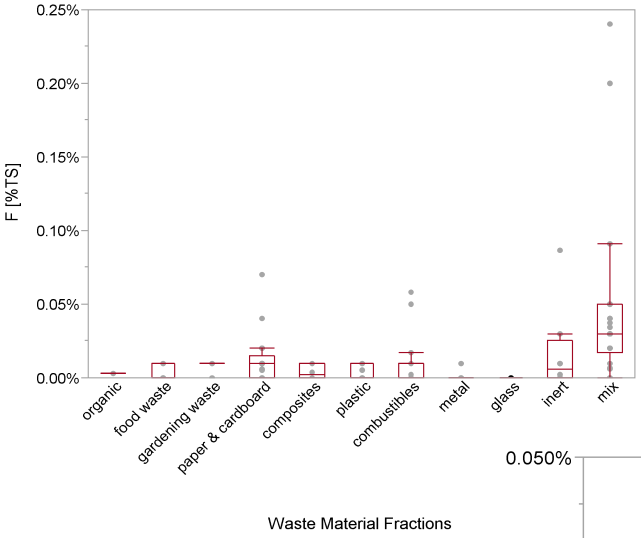
Quantiles [mg/kgTS]

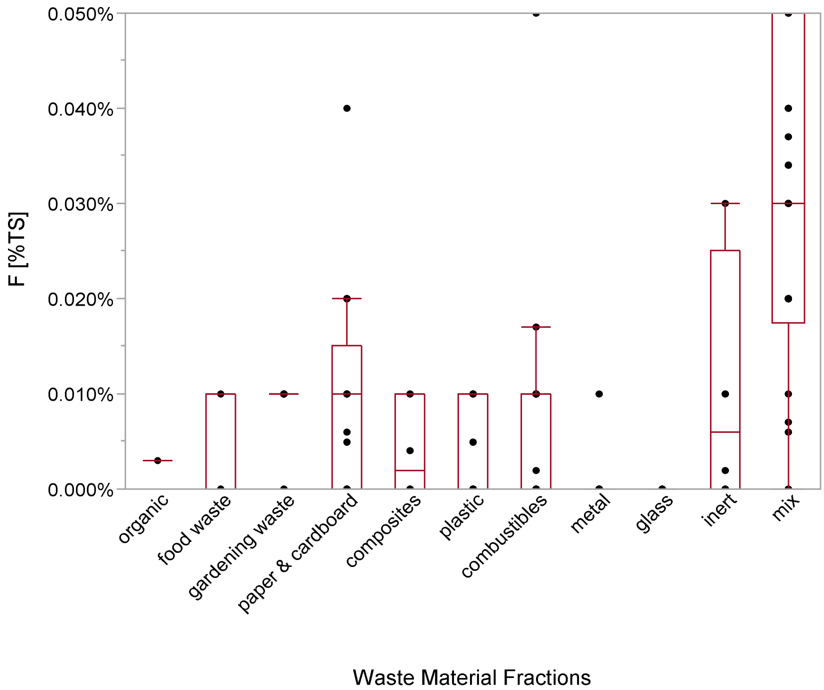
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	59	-	0.00	7.22	10.20	15.10	41.45	250.00	1196.59
food waste	117	40	0.00	2.00	2.00	9.00	42.00	126.82	1168.20
gardening waste	30	-	0.18	0.60	7.93	13.11	31.25	64.30	1238.61
paper & cardboard	72	-	0.00	7.86	17.78	34.76	55.20	98.49	1019.60
composites	9	-	14.00	14.00	17.05	59.40	92.55	834.00	834.00
plastic	57	-	0.00	8.24	16.85	54.20	93.85	201.20	665.30
combustibles	112	-	0.00	8.79	14.35	33.60	65.35	131.93	9240.00
metal	53	1	0.00	0.00	4.55	94.50	288.60	1691.20	45100.00
glass	42	-	0.00	0.00	1.85	8.50	26.00	69.64	267.50
inert	46	-	0.00	0.56	18.58	35.80	51.70	99.70	227.00
mix	110	-	12.17	19.61	35.21	67.93	500.00	1154.99	4500.00
Grand Total	707	41							

*) number of data points

**) number of values below the detection limit

Value ranges for F





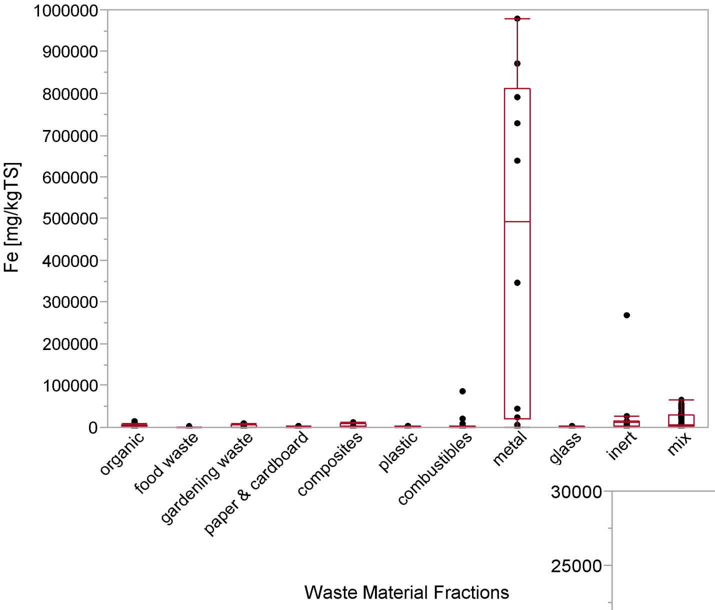
Quantiles [%TS]

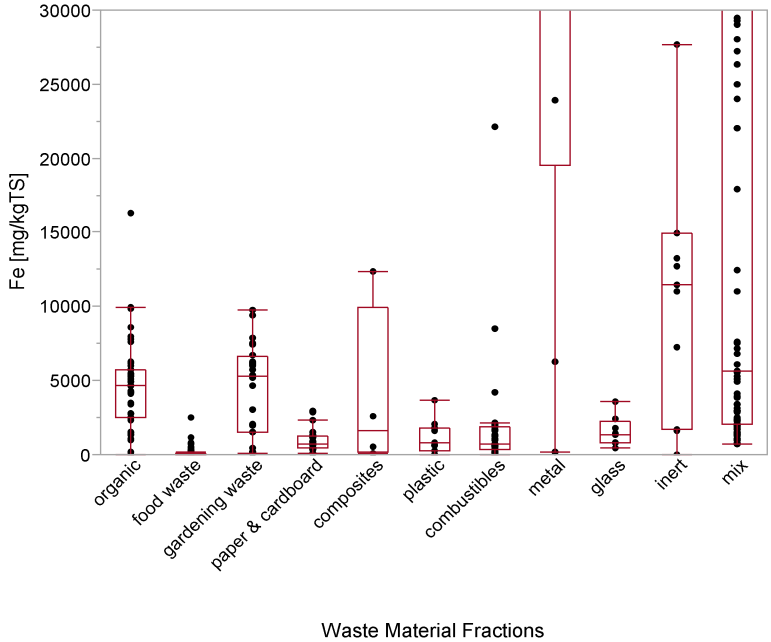
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	-	-	-	-	-	-	-	-	-
food waste	5	-	0.000%	0.000%	0.000%	0.000%	0.010%	0.010%	0.010%
gardening waste	16	12	0.000%	0.000%	0.010%	0.010%	0.010%	0.010%	0.010%
paper & cardboard	21	-	0.000%	0.000%	0.000%	0.010%	0.015%	0.036%	0.070%
composites	6	-	0.000%	0.000%	0.000%	0.002%	0.010%	0.010%	0.010%
plastic	14	-	0.000%	0.000%	0.000%	0.000%	0.010%	0.010%	0.010%
combustibles	25	-	0.000%	0.000%	0.000%	0.010%	0.010%	0.030%	0.058%
metal	17	-	0.000%	0.000%	0.000%	0.000%	0.000%	0.002%	0.010%
glass	6	-	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
inert	8	-	0.000%	0.000%	0.000%	0.006%	0.025%	0.087%	0.087%
mix	22	-	0.000%	0.002%	0.018%	0.030%	0.050%	0.200%	0.240%
Total	140	12							

*) number of data points

**) number of values below the detection limit

Value ranges for Fe





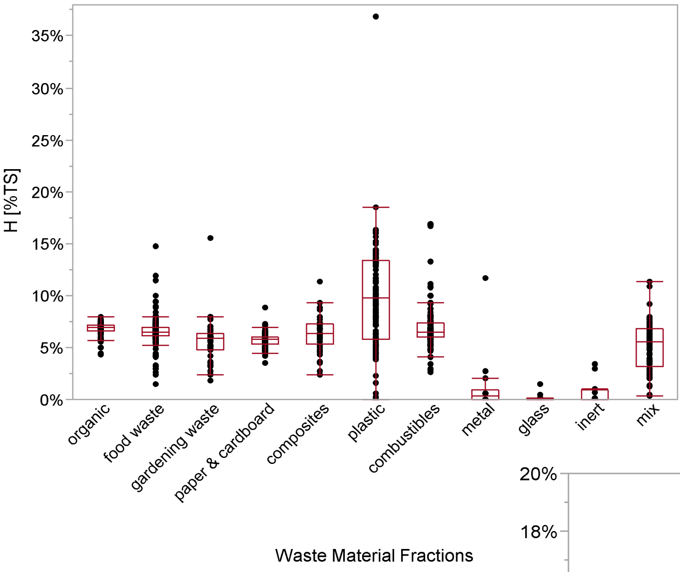
Quantiles [mg/kgTS]

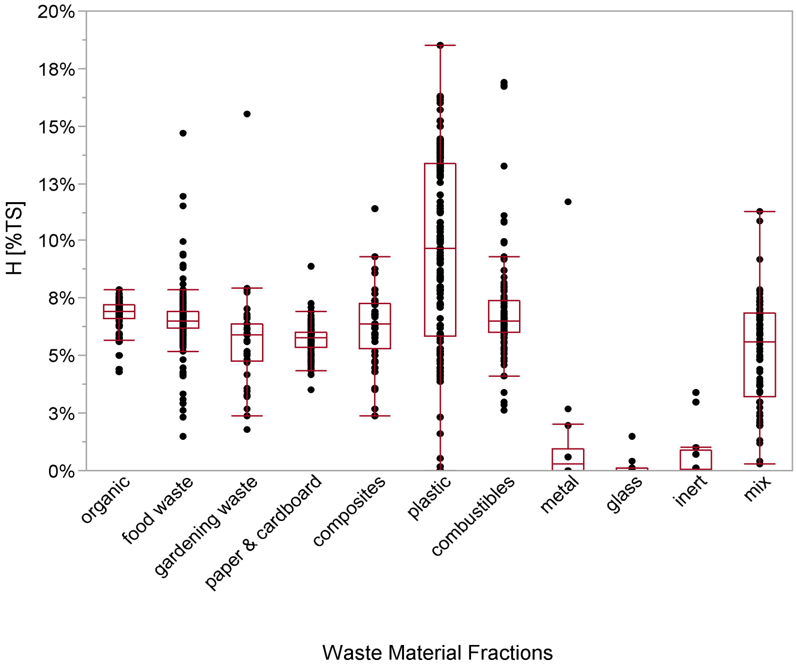
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	45	-	0	1220	2500	4700	5700	8240	16333
food waste	64	-	0	18	29	48	88	409	2478
gardening waste	24	-	76	168	1485	5270	6600	8643	9728
paper & cardboard	22	-	46	147	459	755	1245	2722	2940
composites	4	-	86	86	199	1585	9898	12320	12320
plastic	11	-	0	0	305	849	1830	3380	3700
combustibles	31	-	0	9	340	733	1850	7634	85100
metal	10	-	150	765	19500	492500	810750	969300	980000
glass	8	-	477	477	777	1350	2240	3567	3567
inert	11	-	0	320	1730	11500	14990	219940	268000
mix	82	-	684	1299	2017	5605	30819	49137	66000
Total	312	0							

*) number of data points

**) number of values below the detection limit

Value ranges for H





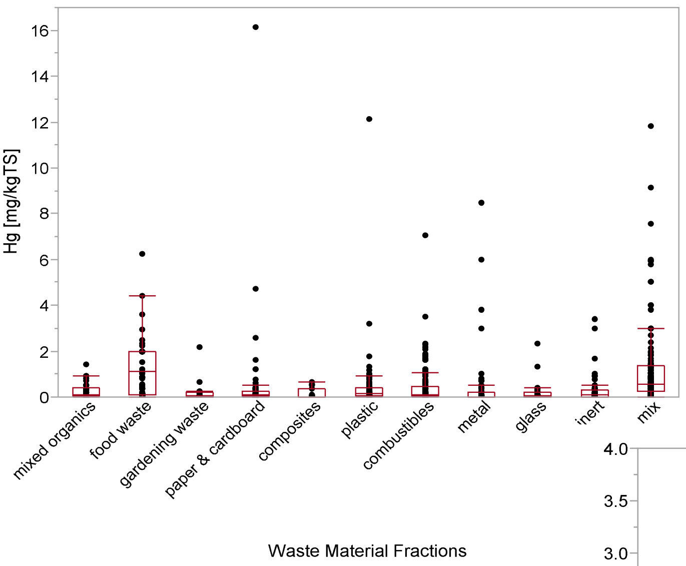
Quantiles [%TS]

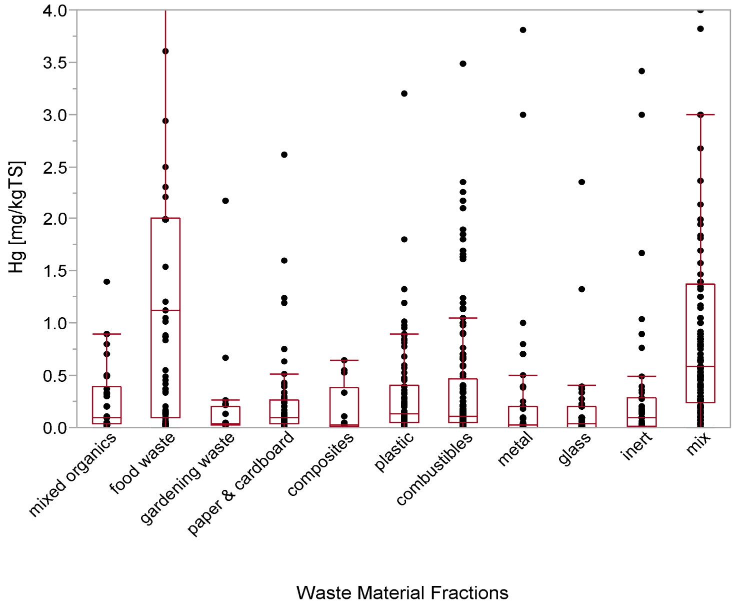
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	59	-	4.3%	5.7%	6.6%	6.9%	7.2%	7.5%	7.9%
food waste	173	-	1.5%	5.5%	6.2%	6.5%	6.9%	7.6%	14.7%
gardening waste	40	-	1.8%	3.2%	4.8%	5.9%	6.4%	7.7%	15.5%
paper & cardboard	112	-	3.5%	4.8%	5.4%	5.8%	6.0%	6.4%	8.9%
composites	40	-	2.4%	3.7%	5.3%	6.4%	7.3%	8.5%	11.4%
plastic	151	-	0.0%	3.9%	5.8%	9.7%	13.4%	14.4%	36.9%
combustibles	138	-	2.6%	5.3%	6.0%	6.5%	7.4%	9.3%	16.9%
metal	14	-	0.0%	0.0%	0.0%	0.3%	1.0%	7.2%	11.7%
glass	13	1	0.0%	0.0%	0.0%	0.0%	0.1%	1.1%	1.5%
inert	12	-	0.0%	0.0%	0.0%	0.1%	0.9%	3.3%	3.4%
mix	73	-	0.3%	2.0%	3.2%	5.6%	6.8%	7.5%	11.3%
Grand Total	825	1							

*) number of data points

**) number of values below the detection limit

Value ranges for Hg



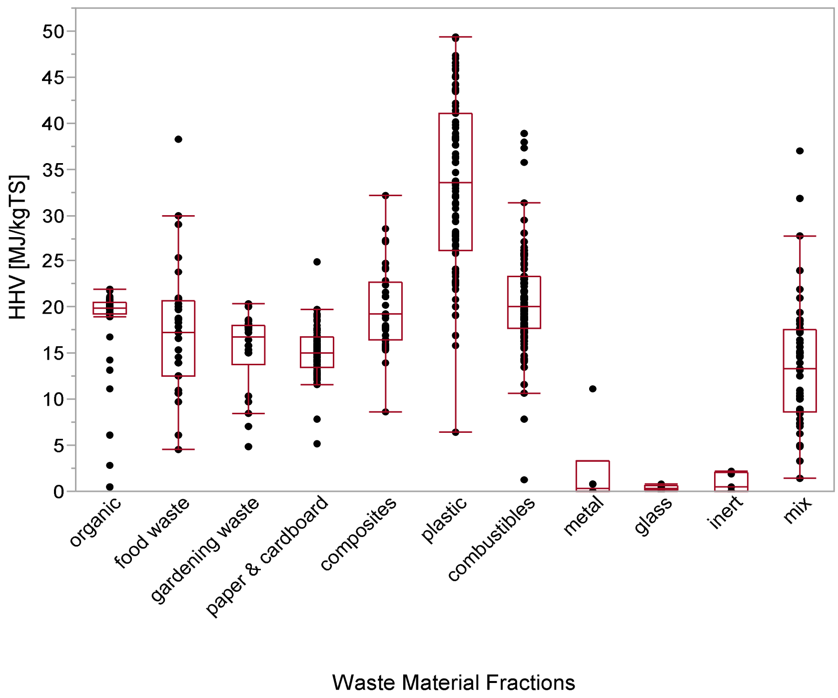


Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	34	4	0.000	0.020	0.040	0.100	0.396	0.850	1.400
food waste	99	41	0.000	0.020	0.100	1.120	2.000	2.000	6.250
*food waste -alt****	*59*	*1*	*0.000*	*0.000*	*0.040*	*0.140*	*0.870*	*2.310*	*6.250*
gardening waste	20	3	0.000	0.020	0.023	0.040	0.198	0.629	2.170
paper & cardboard	84	6	0.000	0.000	0.030	0.098	0.265	0.570	16.160
composites	14	-	0.000	0.000	0.008	0.025	0.380	0.595	0.640
plastic	89	3	0.000	0.000	0.045	0.130	0.400	0.891	12.150
combustibles	140	6	0.000	0.000	0.050	0.110	0.470	1.573	7.030
metal	60	5	0.000	0.000	0.000	0.025	0.200	0.790	8.500
glass	49	6	0.000	0.000	0.000	0.040	0.200	0.340	2.350
inert	49	5	0.000	0.000	0.015	0.100	0.285	0.900	3.420
mix	113	-	0.000	0.070	0.235	0.580	1.375	3.928	11.800
Grand Total	751	79							

*) number of data points
**) number of values below the detection limit
***) alternativ calculation excluding 55 data points from Wrap 2010, which were all below the same detection limit

Value ranges for HHV



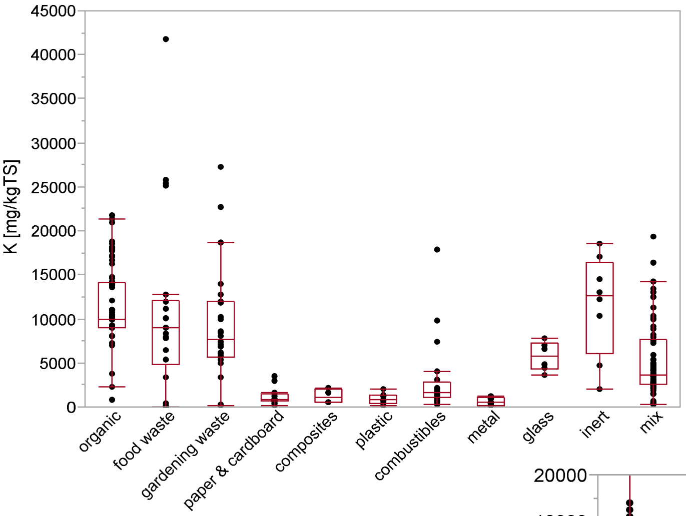
Quantiles [MJ/kgTS]

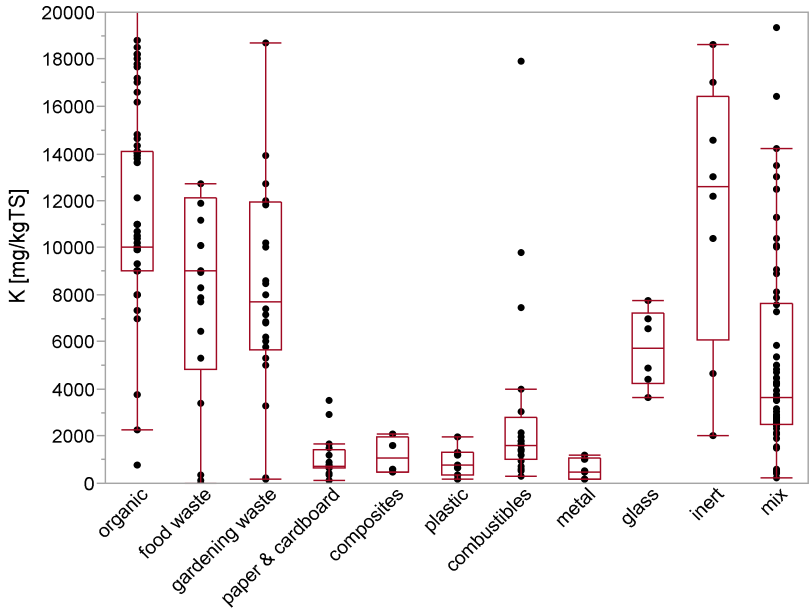
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	55	2	0.5	12.4	19.2	20.0	20.6	21.0	22.0
food waste	29	-	4.6	9.6	12.5	17.3	20.6	29.0	38.3
gardening waste	22	-	4.8	7.4	13.9	16.8	18.0	19.6	20.4
paper & cardboard	79	-	5.2	12.4	13.6	15.1	16.7	18.5	24.9
composites	36	-	8.6	15.4	16.4	19.2	22.8	27.2	32.2
plastic	91	-	6.5	22.4	26.1	33.5	41.0	45.7	49.4
combustibles	100	-	1.3	15.5	17.7	20.0	23.3	26.2	38.9
metal	6	-	0.0	0.0	0.0	0.4	3.3	11.1	11.1
glass	6	2	0.0	0.0	0.1	0.4	0.6	0.8	0.8
inert	5	1	0.0	0.0	0.0	0.5	2.0	2.2	2.2
mix	45	-	1.4	5.8	8.6	13.4	17.5	22.8	37.0
Total	474	5							

*) number of data points

**) number of values below the detection limit

Value ranges for K





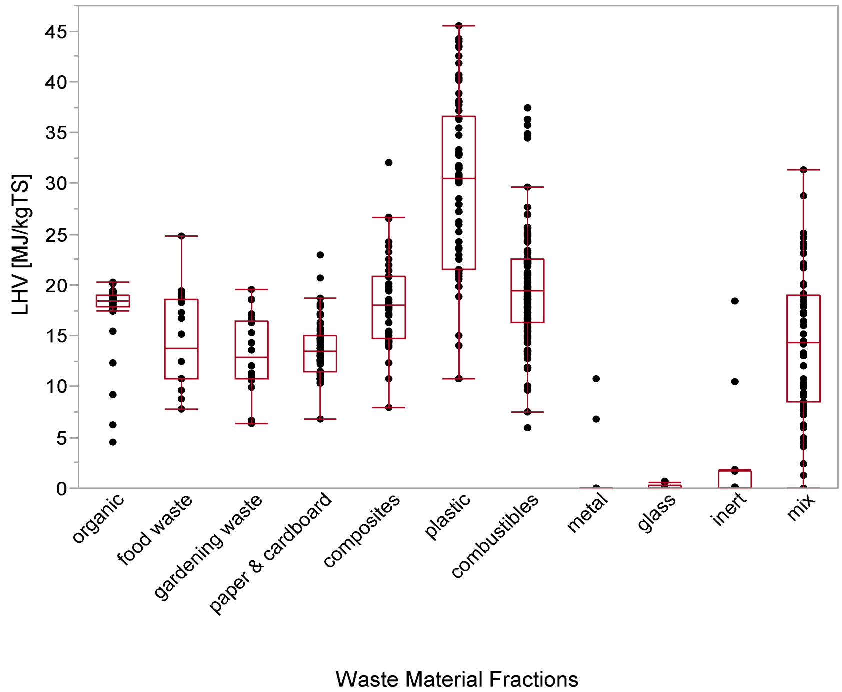
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	76	-	795	8000	9000	10000	14075	18060	21700
food waste	22	-	0	34	4850	8989	12100	25693	41800
gardening waste	26	-	161	216	5677	7695	11960	19900	27300
paper & cardboard	16	-	118	297	676	743	1430	3080	3500
composites	4	-	472	472	497	1096	1980	2100	2100
plastic	7	-	190	190	372	750	1300	1990	1990
combustibles	20	-	278	564	1016	1640	2803	9565	17900
metal	6	-	162	162	191	501	1045	1190	1190
glass	6	-	3650	3650	4237	5730	7195	7750	7750
inert	8	-	2010	2010	6110	12600	16408	18600	18600
mix	70	-	249	1484	2500	3622	7638	12497	19339
Total	261	0							

*) number of data points

**) number of values below the detection limit

Value ranges for LHV



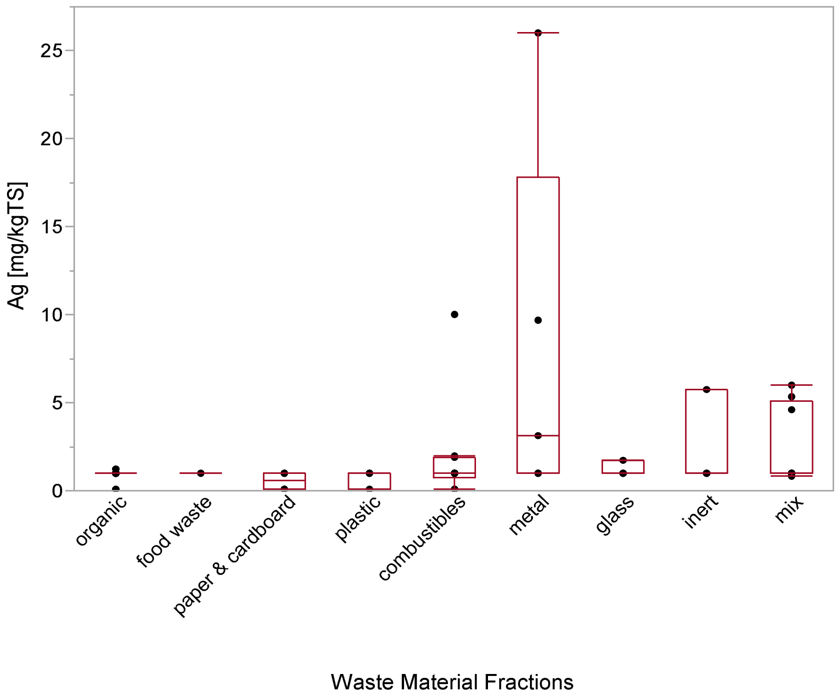
Quantiles [MJ/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	50	-	4.6	15.7	17.9	18.5	18.9	19.4	20.3
food waste	20	-	7.9	8.8	10.8	13.8	18.5	19.4	24.8
gardening waste	20	-	6.4	7.0	10.8	12.8	16.5	18.4	19.5
paper & cardboard	66	-	6.7	10.8	11.5	13.4	15.0	17.3	23.0
composites	39	-	7.9	13.9	14.7	18.0	20.9	24.2	32.1
plastic	74	-	10.8	12.4	21.5	30.5	36.6	42.2	45.5
combustibles	91	-	6.0	13.4	16.3	19.4	22.5	25.7	37.4
metal	11	-	-0.1	-0.1	0.0	0.0	0.0	9.9	10.7
glass	9	-	0.0	0.0	0.0	0.0	0.3	0.7	0.7
inert	12	-	0.0	0.0	0.0	0.0	1.8	16.1	18.5
mix	57	-	0.0	4.9	8.5	14.4	19.0	24.1	31.3
Total	449	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Ag



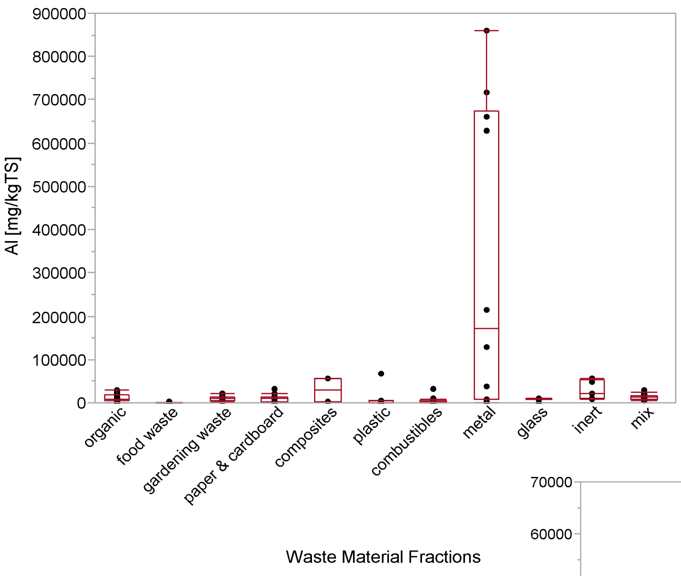
Quantiles [mg/kgTS]

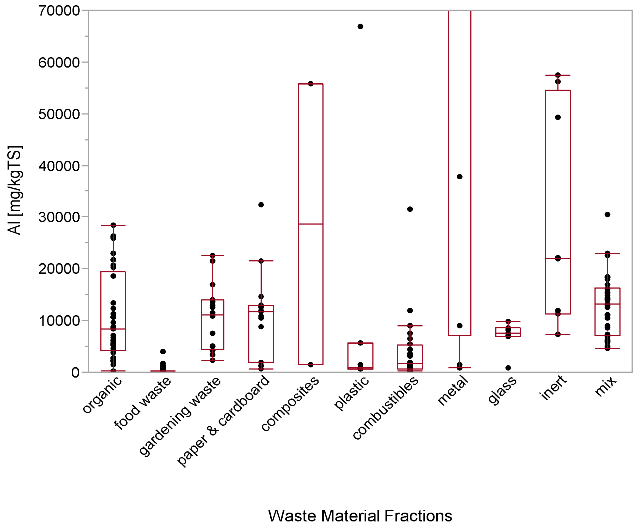
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	7	0.08	0.08	1.00	1.00	1.00	1.20	1.20
food waste	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	4	3	0.08	0.08	0.09	0.56	1.00	1.00	1.00
composites	-	-	-	-	-	-	-	-	-
plastic	3	3	0.08	0.08	0.08	1.00	1.00	1.00	1.00
combustibles	10	7	0.08	0.08	0.77	1.00	1.93	9.20	10.00
metal	5	4	1.00	1.00	1.00	3.14	17.85	26.00	26.00
glass	3	2	1.00	1.00	1.00	1.00	1.71	1.71	1.71
inert	3	2	1.00	1.00	1.00	1.00	5.78	5.78	5.78
mix	8	4	0.86	0.86	1.00	1.00	5.12	6.02	6.02
Total	46	33							

*) number of data points

**) number of values below the detection limit

Value ranges for Al



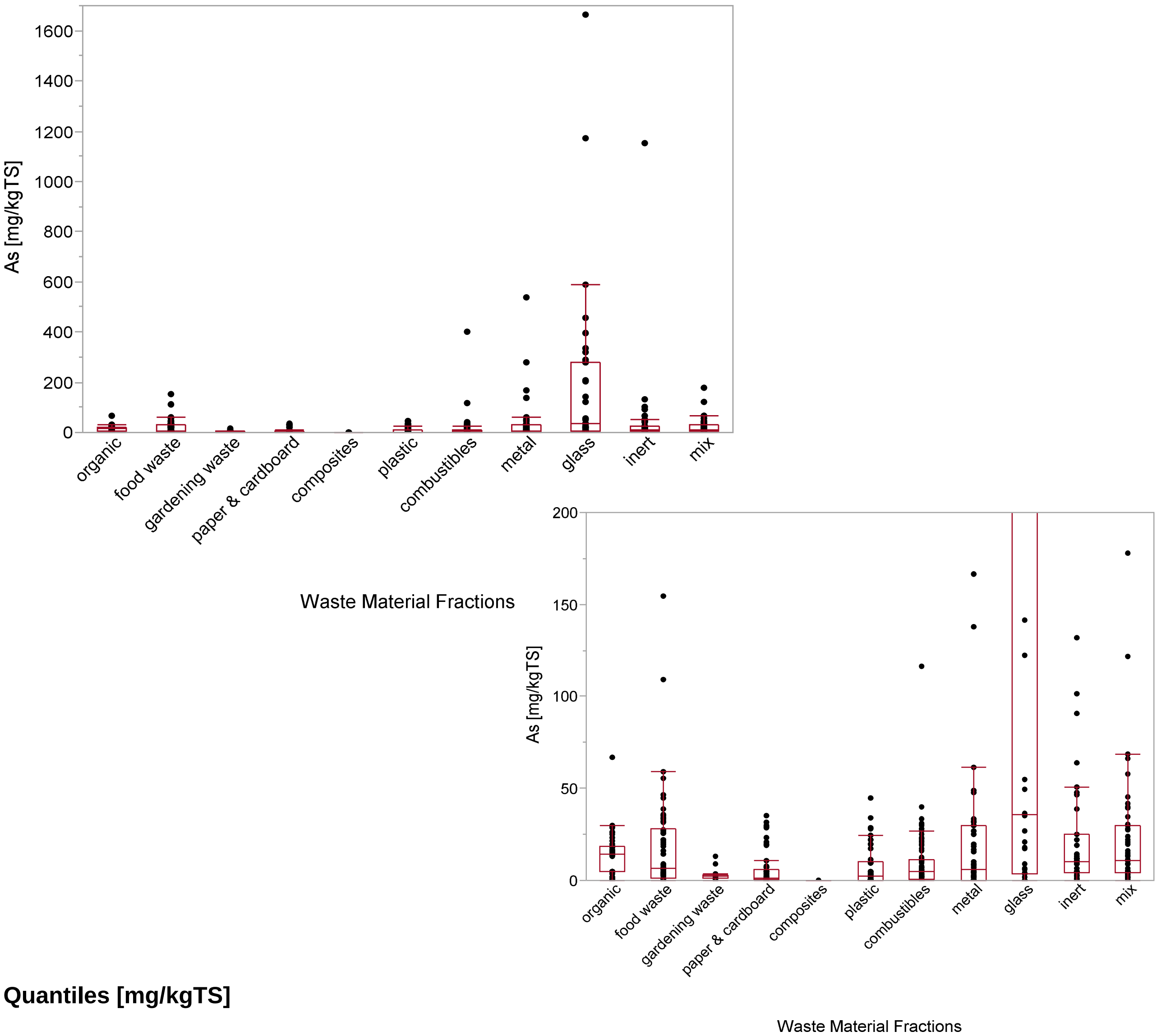


Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	41	-	286	2160	4100	8400	19464	25412	28333
food waste	47	-	12	21	30	46	103	851	3890
gardening waste	16	-	2360	3088	4453	11178	13916	21859	22550
paper & cardboard	15	-	681	1033	1800	11700	12933	25870	32425
composites	2	-	1430	1430	1430	28615	55800	55800	55800
plastic	7	-	692	692	720	820	5650	66800	66800
combustibles	24	-	200	250	678	1570	5150	10500	31600
metal	10	-	860	926	7055	171500	674500	846700	861000
glass	7	-	750	750	6860	7620	8470	9870	9870
inert	8	-	7300	7300	11361	22000	54483	57500	57500
mix	34	-	4670	5435	7118	13080	16280	20478	30500
Grand Total	209	-							

*) number of data points
**) number of values below the detection limit

Value ranges for As



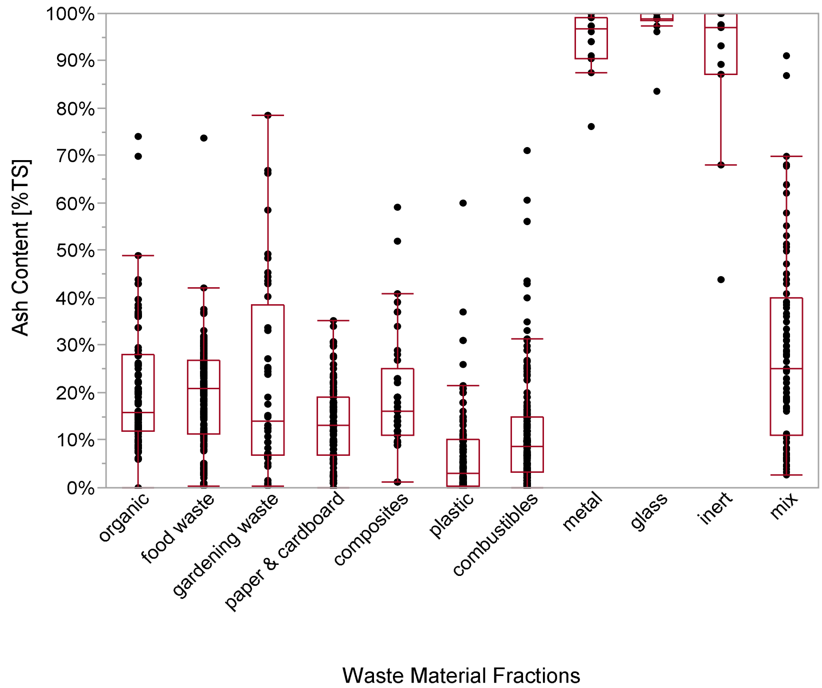
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	48	8	0.200	0.699	5.000	14.565	18.605	26.385	67.000
food waste	54	1	0.000	0.000	1.000	6.750	28.350	45.550	154.400
gardening waste	18	-	0.000	0.495	1.188	2.405	3.080	9.582	13.020
paper & cardboard	57	4	0.000	0.126	0.345	1.090	6.100	24.100	35.100
composites	3	-	0.140	0.140	0.140	0.200	0.200	0.200	0.200
plastic	46	5	0.000	0.000	0.215	2.250	10.075	25.580	44.800
combustibles	89	10	0.000	0.000	0.305	5.000	11.340	28.170	400.000
metal	45	1	0.000	0.000	0.000	6.200	29.800	92.040	539.000
glass	36	-	0.000	0.000	3.800	35.900	280.475	497.680	1664.400
inert	39	2	0.000	0.000	4.000	10.400	25.000	91.000	1153.000
mix	50	2	0.000	1.633	4.060	10.950	30.068	56.465	177.990
Grand Total	485	33							

*) number of data points

**) number of values below the detection limit

Value ranges for Ash Content



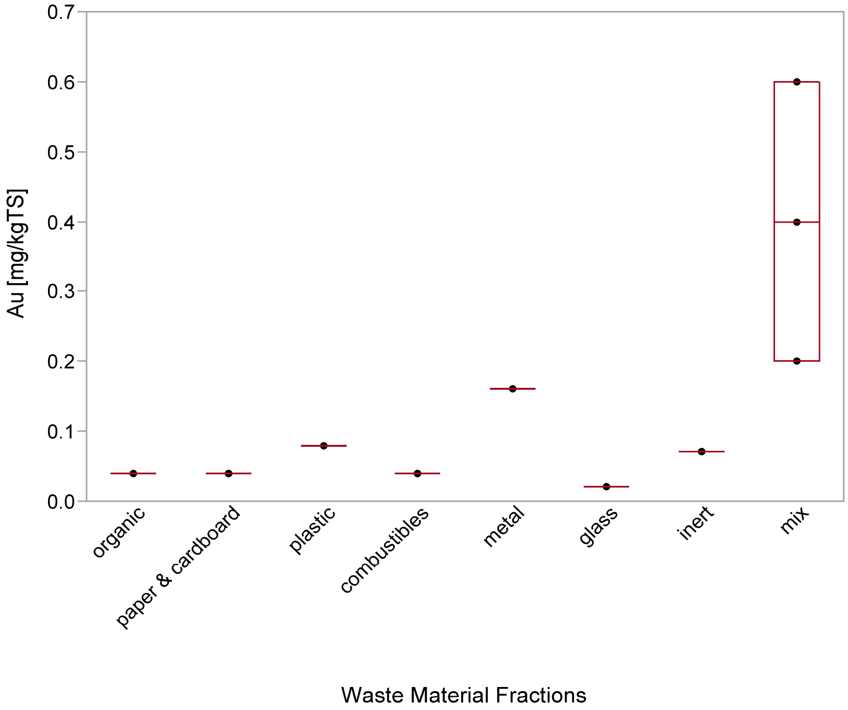
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	106	-	0.0%	8.5%	12.0%	15.7%	28.0%	38.0%	74.0%
food waste	196	-	0.2%	3.8%	11.5%	20.9%	26.9%	30.0%	73.7%
gardening waste	44	-	0.4%	3.0%	6.8%	14.0%	38.6%	53.9%	78.4%
paper & cardboard	112	-	0.0%	2.4%	6.8%	13.0%	19.0%	25.7%	35.4%
composites	41	-	1.2%	9.0%	11.0%	16.0%	25.0%	38.6%	59.0%
plastic	119	-	0.0%	0.1%	0.4%	3.0%	10.0%	18.0%	60.0%
combustibles	146	-	0.0%	1.0%	3.2%	8.7%	15.1%	26.6%	71.0%
metal	18	-	76.1%	86.5%	90.5%	96.7%	99.3%	100.0%	100.0%
glass	14	-	83.5%	89.8%	98.5%	98.9%	100.0%	100.0%	100.0%
inert	11	-	43.9%	48.7%	87.2%	97.0%	100.0%	100.0%	100.0%
mix	85	-	2.6%	6.1%	11.0%	25.0%	39.9%	62.8%	91.0%
Total	892	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Au



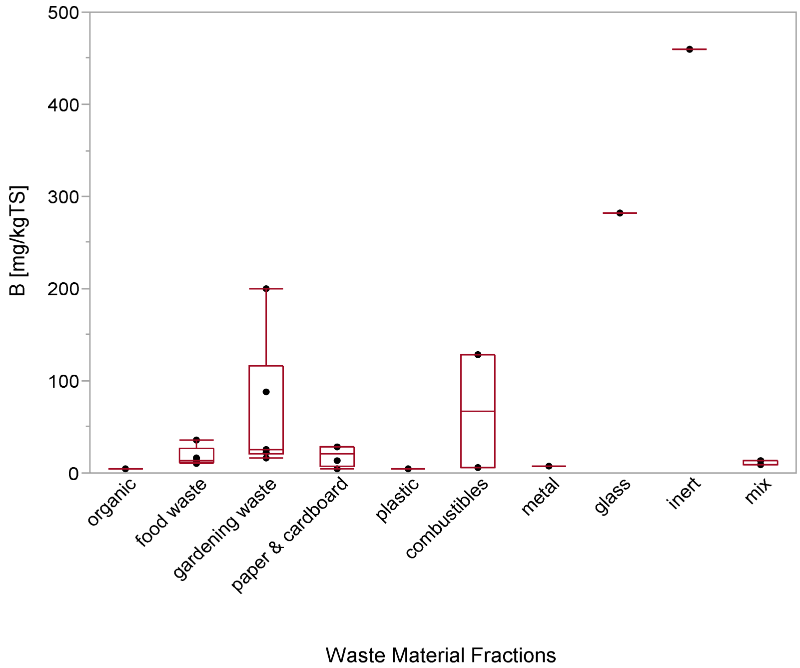
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	1	0.04	0.04	0.04	0.04	0.04	0.04	0.04
food waste	-	-	-	-	-	-	-	-	-
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	2	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04
composites	-	-	-	-	-	-	-	-	-
plastic	1	1	0.08	0.08	0.08	0.08	0.08	0.08	0.08
combustibles	2	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04
metal	1	-	0.16	0.16	0.16	0.16	0.16	0.16	0.16
glass	1	1	0.02	0.02	0.02	0.02	0.02	0.02	0.02
inert	1	-	0.07	0.07	0.07	0.07	0.07	0.07	0.07
mix	3	-	0.20	0.20	0.20	0.40	0.60	0.60	0.60
Grand Total	12	7							

*) number of data points

**) number of values below the detection limit

Value ranges for B



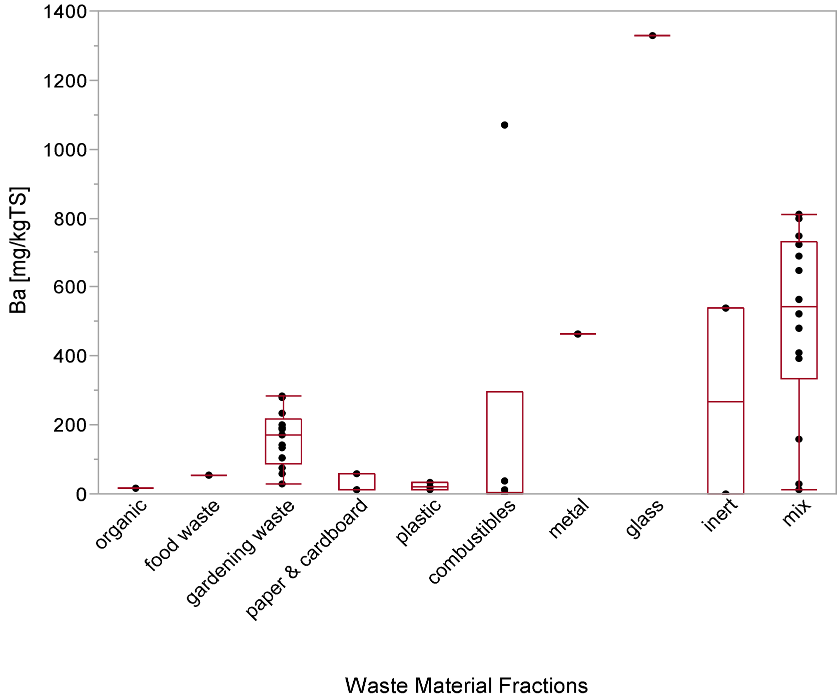
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	-	5.1	5.1	5.1	5.1	5.1	5.1	5.1
food waste	5	-	11.0	11.0	11.5	13.0	26.5	36.0	36.0
gardening waste	6	-	17.0	17.0	20.8	25.5	116.0	200.0	200.0
paper & cardboard	4	-	4.6	4.6	6.9	21.0	28.5	28.7	28.7
composites	-	-	-	-	-	-	-	-	-
plastic	1	-	4.1	4.1	4.1	4.1	4.1	4.1	4.1
combustibles	2	-	5.6	5.6	5.6	66.8	128.0	128.0	128.0
metal	1	-	7.4	7.4	7.4	7.4	7.4	7.4	7.4
glass	1	-	282.0	282.0	282.0	282.0	282.0	282.0	282.0
inert	1	-	459.0	459.0	459.0	459.0	459.0	459.0	459.0
mix	3	-	8.6	8.6	8.6	14.0	14.0	14.0	14.0
Grand Total	25	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Ba



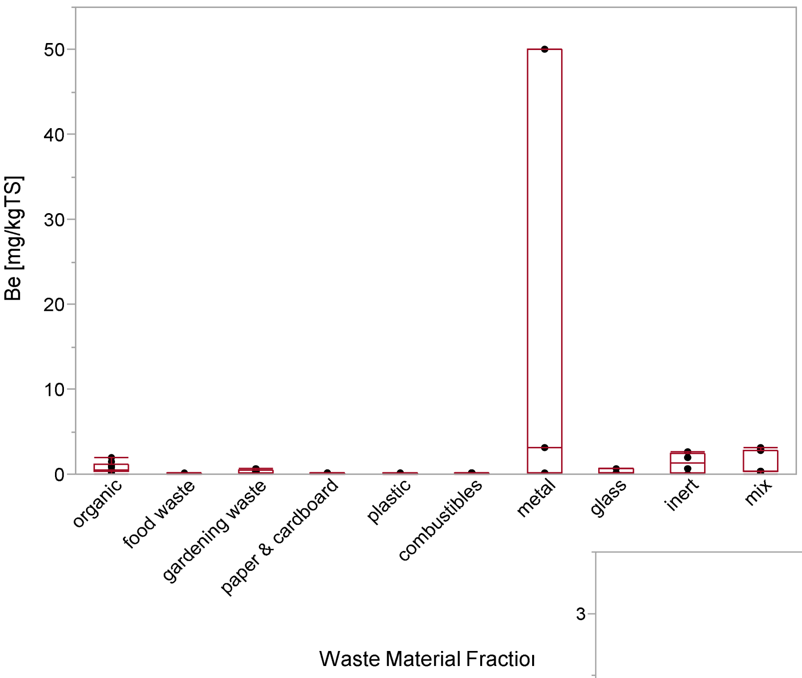
Quantiles [mg/kgTS]

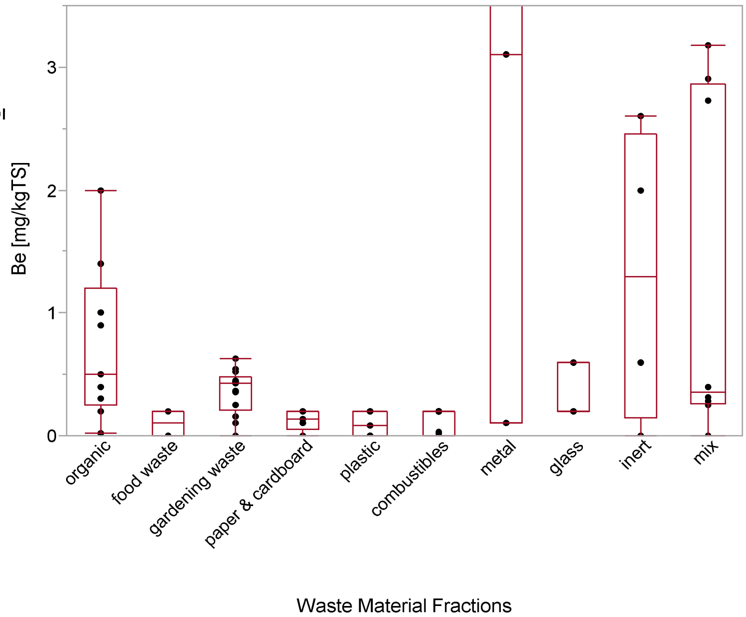
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	-	18.1	18.1	18.1	18.1	18.1	18.1	18.1
food waste	1	-	55.1	55.1	55.1	55.1	55.1	55.1	55.1
gardening waste	13	-	27.8	39.5	89.1	170.2	216.1	282.7	283.3
paper & cardboard	3	-	12.3	12.3	12.3	12.5	60.1	60.1	60.1
composites	-	-	-	-	-	-	-	-	-
plastic	3	-	12.8	12.8	12.8	22.5	33.4	33.4	33.4
combustibles	6	-	0.0	0.0	0.0	5.3	297.5	1071.0	1071.0
metal	1	-	464.0	464.0	464.0	464.0	464.0	464.0	464.0
glass	1	-	1330.0	1330.0	1330.0	1330.0	1330.0	1330.0	1330.0
inert	2	-	0.0	0.0	0.0	269.5	539.0	539.0	539.0
mix	14	-	13.6	21.0	335.8	543.5	730.0	804.5	809.0
Grand Total	45	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Be





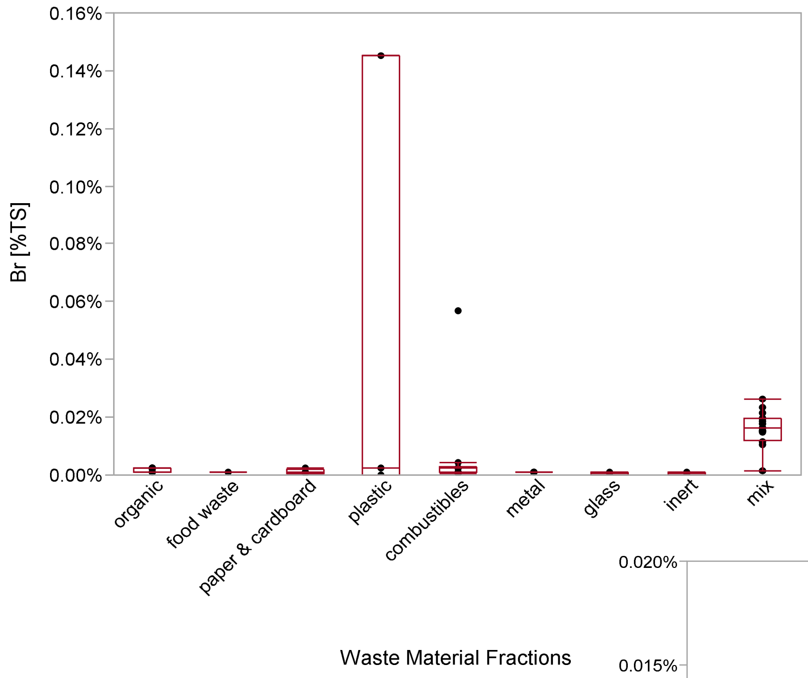
Quantiles [mg/kgTS]

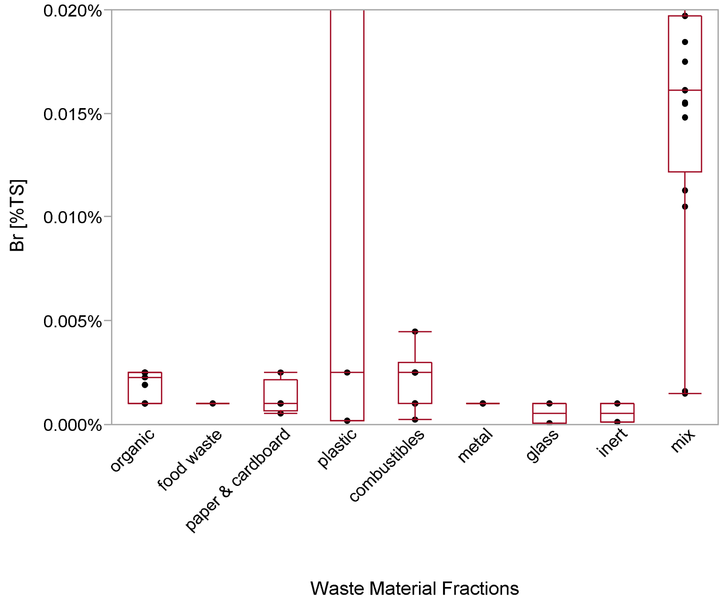
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	1	0.02	0.02	0.25	0.50	1.20	2.00	2.00
food waste	2	-	0.00	0.00	0.00	0.10	0.20	0.20	0.20
gardening waste	13	-	0.00	0.04	0.21	0.43	0.49	0.59	0.63
paper & cardboard	5	-	0.00	0.00	0.05	0.14	0.20	0.20	0.20
composites	-	-	-	-	-	-	-	-	-
plastic	5	1	0.00	0.00	0.00	0.08	0.20	0.20	0.20
combustibles	14		0.00	0.00	0.00	0.20	0.20	0.20	0.20
metal	3	1	0.10	0.10	0.10	3.10	50.00	50.00	50.00
glass	3	-	0.20	0.20	0.20	0.20	0.60	0.60	0.60
inert	4	-	0.00	0.00	0.15	1.30	2.45	2.60	2.60
mix	8	-	0.00	0.00	0.26	0.36	2.86	3.18	3.18
Grand Total	66	3							

*) number of data points

**) number of values below the detection limit

Value ranges for Br





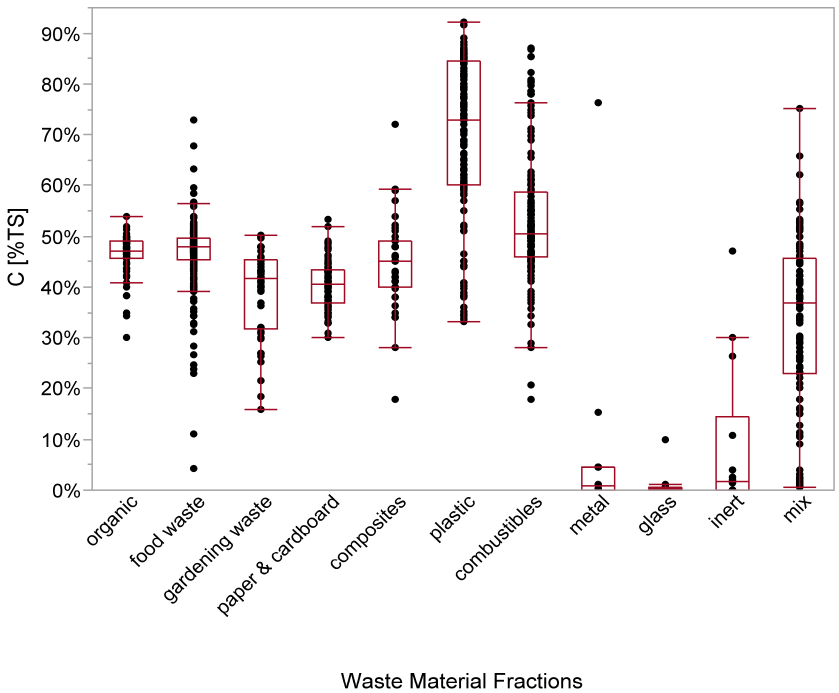
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	7	0.001%	0.001%	0.001%	0.002%	0.003%	0.003%	0.003%
food waste	1	1	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	4	2	0.001%	0.001%	0.001%	0.001%	0.002%	0.003%	0.003%
composites	-	-	-	-	-	-	-	-	-
plastic	3	1	0.000%	0.000%	0.000%	0.003%	0.145%	0.145%	0.145%
combustibles	10	7	0.000%	0.000%	0.001%	0.003%	0.003%	0.052%	0.057%
metal	2	2	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
glass	2	2	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%
inert	2	1	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%
mix	16	1	0.002%	0.002%	0.012%	0.016%	0.020%	0.024%	0.026%
Total	49	24							

*) number of data points

**) number of values below the detection limit

Value ranges for C



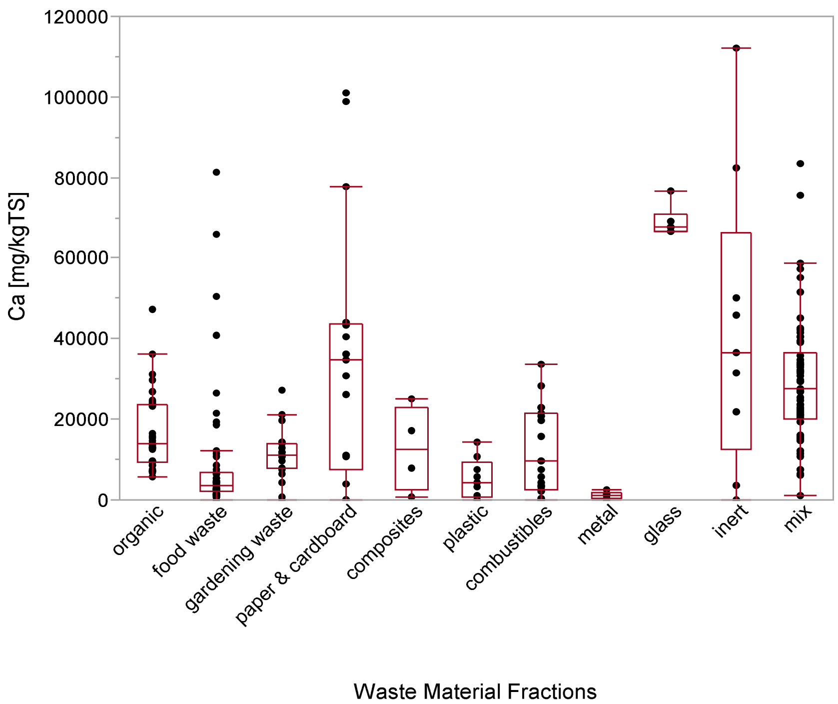
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	61	-	30.0%	40.2%	45.6%	47.2%	49.0%	50.0%	54.0%
food waste	211	-	4.4%	39.5%	45.2%	47.9%	49.8%	51.6%	73.0%
gardening waste	49	-	15.8%	26.5%	31.7%	41.8%	45.5%	47.8%	50.1%
paper & cardboard	113	-	30.2%	34.4%	37.0%	40.5%	43.3%	46.2%	53.4%
composites	42	-	18.0%	34.0%	39.9%	45.0%	49.0%	56.1%	72.0%
plastic	137	-	33.3%	40.7%	60.0%	73.0%	84.5%	86.1%	92.1%
combustibles	152	-	18.0%	42.6%	46.1%	50.5%	58.6%	76.2%	87.1%
metal	14	-	0.0%	0.0%	0.0%	0.8%	4.5%	45.7%	76.2%
glass	14	-	0.0%	0.0%	0.0%	0.4%	0.5%	5.5%	9.8%
inert	14	-	0.0%	0.0%	0.0%	1.6%	14.6%	38.6%	47.1%
mix	104	-	0.6%	3.5%	23.0%	36.8%	45.8%	52.2%	75.2%
Grand Total	911	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Ca



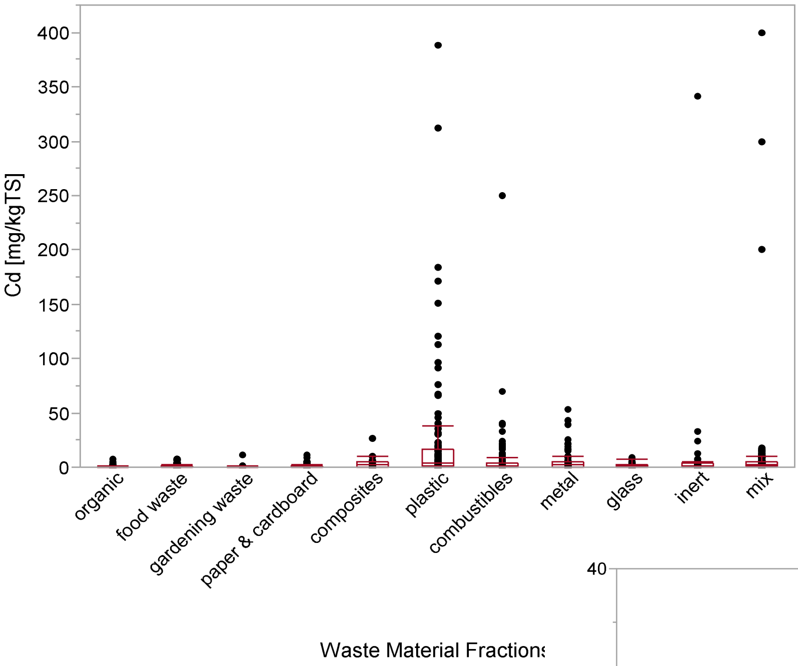
Quantiles [mg/kgTS]

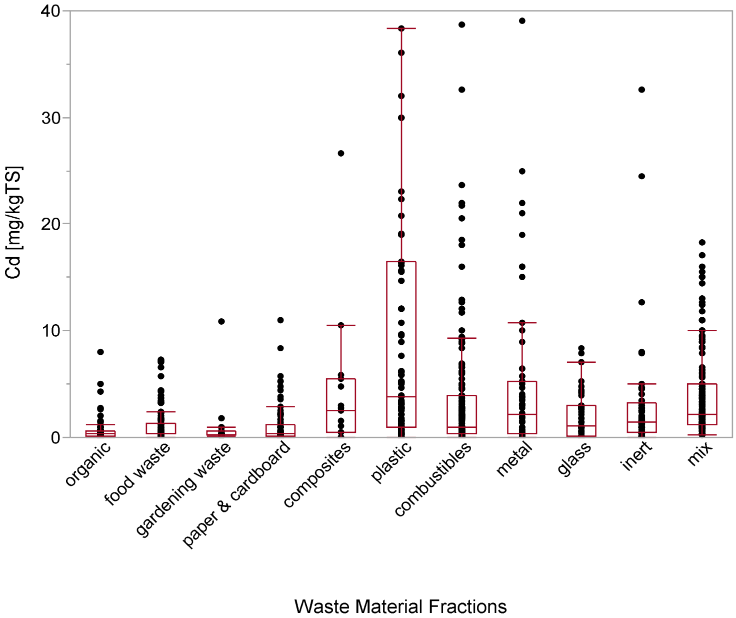
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	38	-	5700	7180	9475	14000	23750	29850	47313
food waste	57	-	0	1156	1977	3611	6709	22553	81250
gardening waste	21	-	0	1306	7750	11256	14149	20838	27100
paper & cardboard	17	-	0	0	7415	34600	43600	99160	101000
composites	4	-	727	727	2500	12555	23080	25010	25010
plastic	9	-	21.5	22	577	4160	9270	14260	14260
combustibles	23	-	45.7	51	2390	9510	21522	26140	33770
metal	6	-	36	36	192	1143	1728	2410	2410
glass	6	-	66730	66730	66783	67775	70900	76600	76600
inert	9	-	0	0	12675	36400	66303	112110	112110
mix	62	-	1228.6	10950	20075	27500	36675	49640	83550
Grand Total	252	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Cd





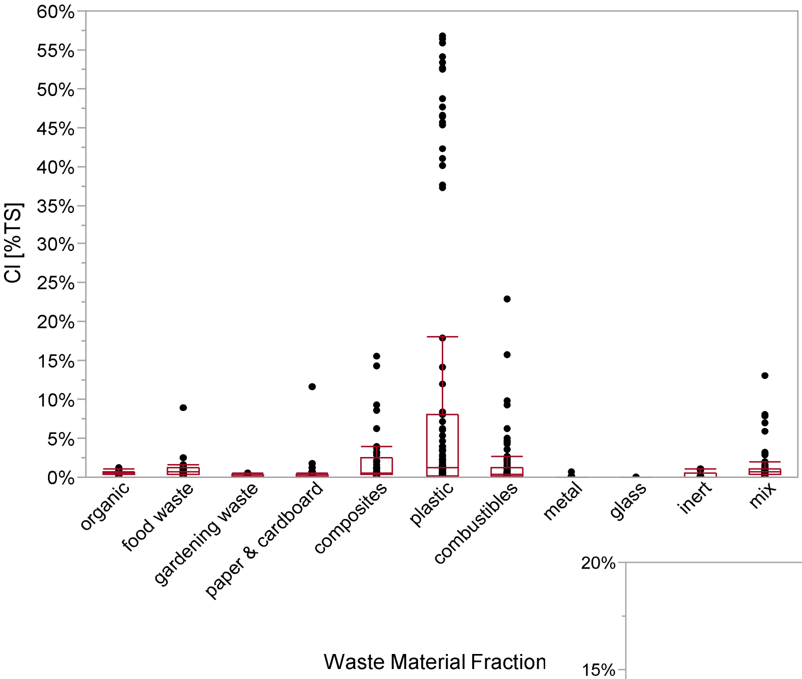
Quantiles [mg/kgTS]

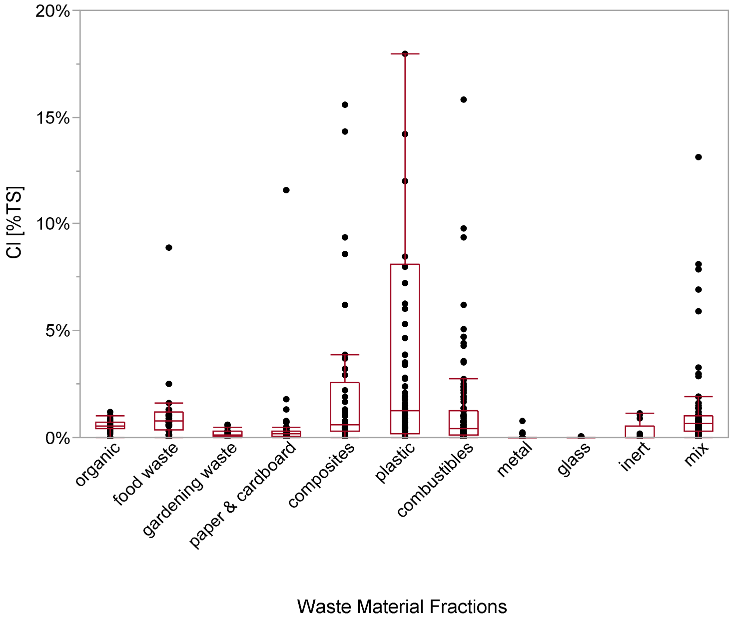
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	71	5	0.00	0.08	0.15	0.35	0.60	1.56	7.95
food waste	100	42	0.00	0.10	0.40	0.40	1.28	3.49	7.30
gardening waste	23	-	0.11	0.16	0.20	0.25	0.60	1.48	10.85
paper & cardboard	88	4	0.00	0.00	0.09	0.30	1.25	3.62	11.00
composites	15	-	0.00	0.01	0.50	2.52	5.50	16.94	26.60
plastic	103	2	0.00	0.20	0.90	3.80	16.50	72.68	388.00
combustibles	158	3	0.00	0.00	0.30	1.00	3.93	11.73	250.00
metal	71	5	0.00	0.00	0.30	2.10	5.20	18.40	53.00
glass	49	4	0.00	0.00	0.15	1.10	2.95	4.80	8.40
inert	50	-	0.00	0.00	0.50	1.45	3.28	7.99	341.00
mix	141	-	0.20	0.76	1.25	2.17	5.04	11.67	400.00
Grand Total	869	65							

*) number of data points

**) number of values below the detection limit

Value ranges for Cl





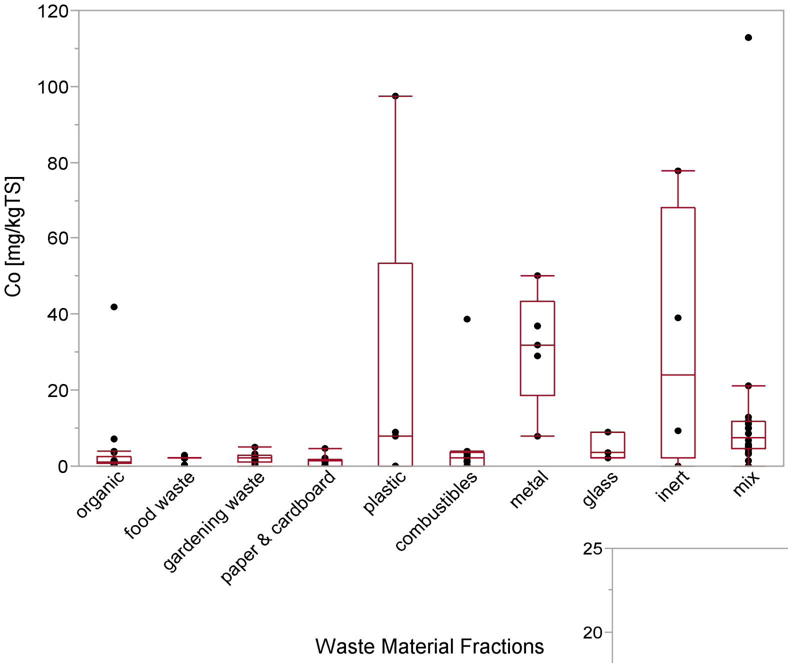
Quantiles [%TS]

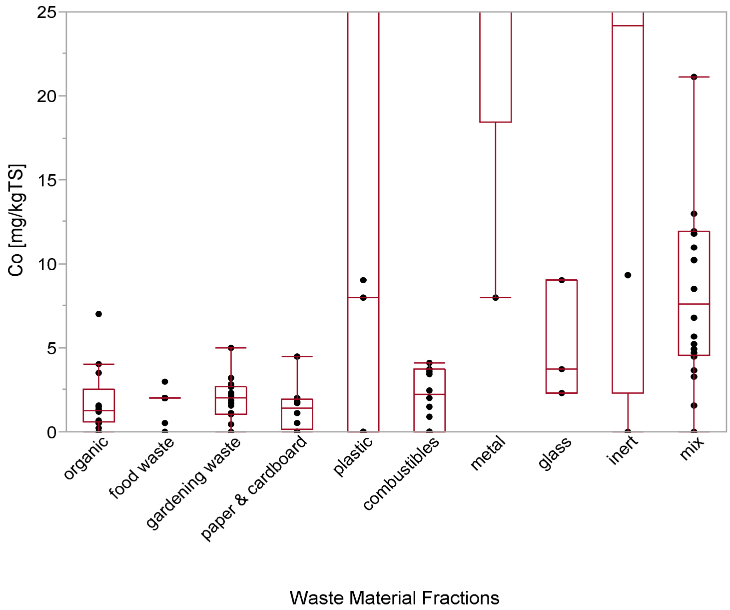
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	58	-	0.001%	0.165%	0.400%	0.532%	0.700%	0.806%	1.200%
food waste	20	-	0.000%	0.012%	0.365%	0.765%	1.173%	2.413%	8.900%
gardening waste	26	-	0.000%	0.047%	0.078%	0.110%	0.283%	0.530%	0.600%
paper & cardboard	75	-	0.000%	0.001%	0.070%	0.160%	0.300%	0.500%	11.600%
composites	41	-	0.000%	0.000%	0.300%	0.600%	2.550%	8.120%	15.600%
plastic	90	-	0.000%	0.000%	0.200%	1.250%	8.125%	47.605%	56.800%
combustibles	114	-	0.000%	0.000%	0.100%	0.400%	1.248%	3.550%	23.000%
metal	19	-	0.000%	0.000%	0.000%	0.000%	0.001%	0.240%	0.760%
glass	10	-	0.000%	0.000%	0.000%	0.000%	0.000%	0.054%	0.060%
inert	13	-	0.000%	0.000%	0.000%	0.020%	0.550%	1.094%	1.110%
mix	81	-	0.000%	0.104%	0.305%	0.670%	1.000%	2.692%	13.160%
Total	547	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Co





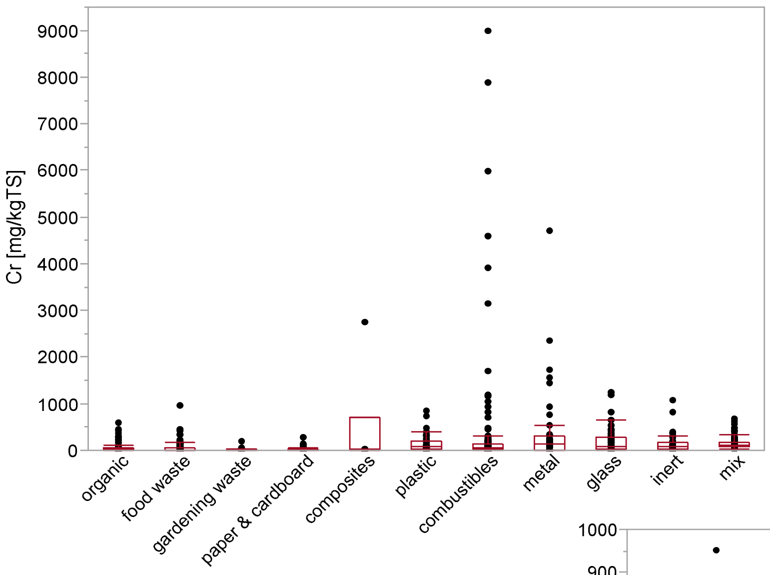
Quantiles [mg/kgTS]

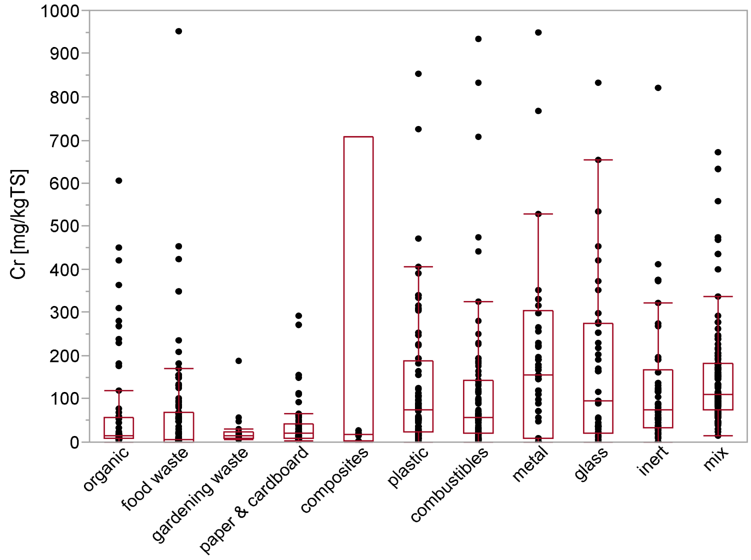
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	17	1	0.0	0.2	0.6	1.3	2.6	14.0	42.0
food waste	43	41	0.0	2.0	2.0	2.0	2.0	2.0	3.0
gardening waste	14	-	0.0	0.2	1.1	2.0	2.7	4.1	5.0
paper & cardboard	8	1	0.0	0.0	0.1	1.4	2.0	4.5	4.5
composites	-	-	-	-	-	-	-	-	-
plastic	5	-	0.0	0.0	0.0	8.0	53.3	97.6	97.6
combustibles	14	-	0.0	0.0	0.0	2.3	3.7	21.4	38.7
metal	5	-	8.0	8.0	18.5	32.0	43.5	50.0	50.0
glass	3	-	2.3	2.3	2.3	3.7	9.0	9.0	9.0
inert	4	-	0.0	0.0	2.3	24.2	68.0	77.7	77.7
mix	20	-	0.0	1.8	4.5	7.6	11.9	103.8	113.0
Grand Total	133	43							

*) number of data points

**) number of values below the detection limit

Value ranges for Cr





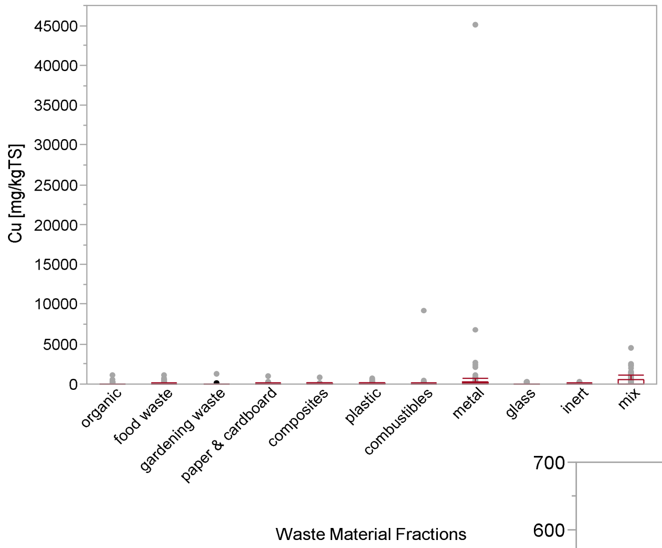
Quantiles [mg/kgTS]

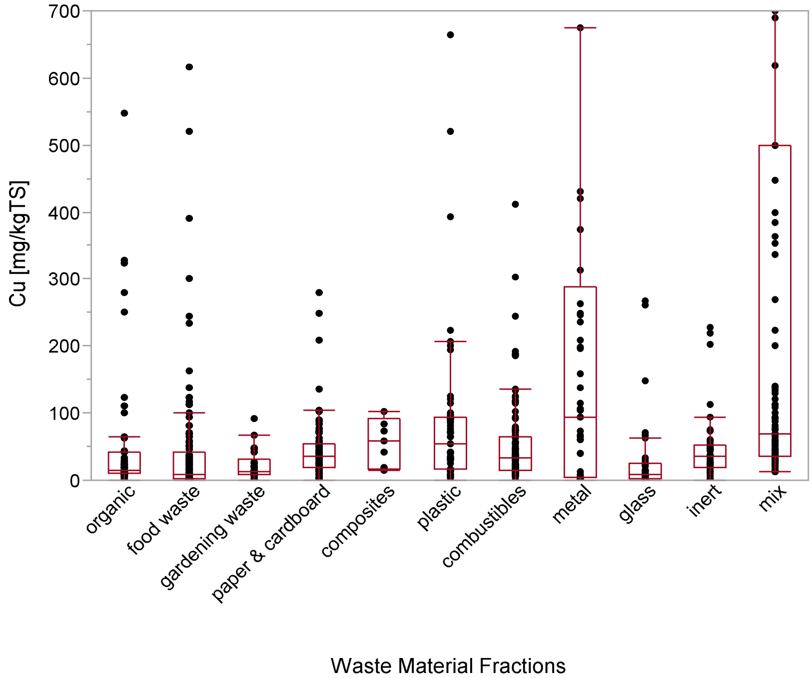
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	62	-	1.3	6.2	8.4	14.8	56.3	277.0	607.0
food waste	103	17	0.0	1.0	1.1	5.2	69.0	155.3	951.5
gardening waste	19	1	4.5	8.0	8.7	16.2	23.0	55.5	188.7
paper & cardboard	65	-	2.5	5.4	8.8	20.0	40.3	99.4	291.8
composites	6	-	1.0	1.0	2.4	18.5	708.5	2750.0	2750.0
plastic	73	-	0.4	9.7	25.4	73.9	187.0	338.4	853.0
combustibles	122	-	0.0	6.2	19.8	56.4	142.2	795.3	9000.0
metal	50	-	0.0	0.0	9.2	154.5	304.3	1387.0	4702.0
glass	49	-	0.0	0.0	21.6	95.3	275.7	534.0	1236.8
inert	50	-	0.0	13.4	34.0	74.3	167.5	377.1	1075.5
mix	116	-	16.0	53.0	74.8	111.8	182.3	277.1	671.1
Grand Total	715	18							

*) number of data points

**) number of values below the detection limit

Value ranges for Cu





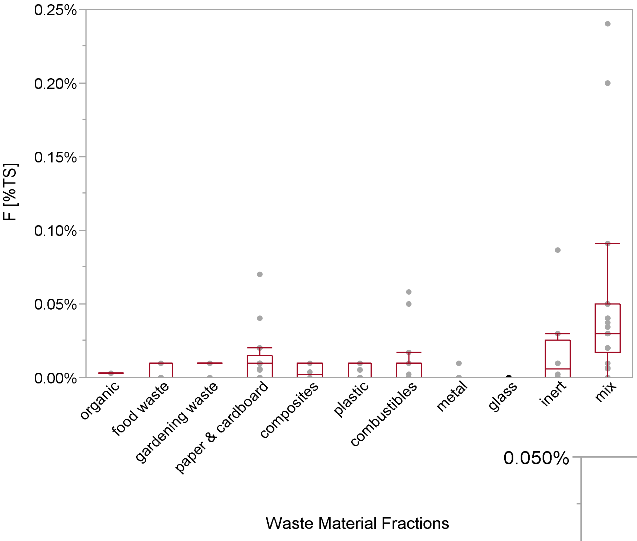
Quantiles [mg/kgTS]

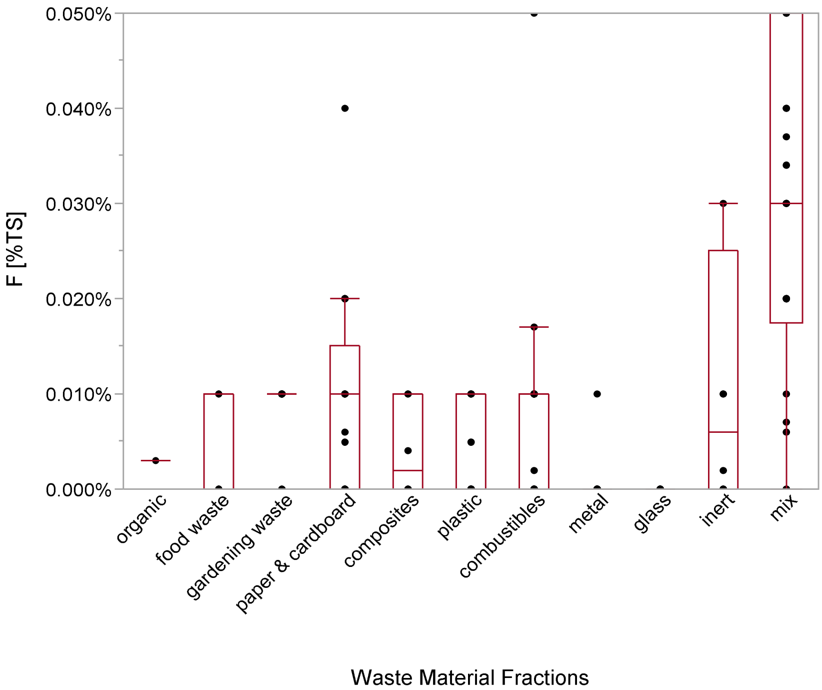
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	59	-	0.00	7.22	10.20	15.10	41.45	250.00	1196.59
food waste	117	40	0.00	2.00	2.00	9.00	42.00	126.82	1168.20
gardening waste	30	-	0.18	0.60	7.93	13.11	31.25	64.30	1238.61
paper & cardboard	72	-	0.00	7.86	17.78	34.76	55.20	98.49	1019.60
composites	9	-	14.00	14.00	17.05	59.40	92.55	834.00	834.00
plastic	57	-	0.00	8.24	16.85	54.20	93.85	201.20	665.30
combustibles	112	-	0.00	8.79	14.35	33.60	65.35	131.93	9240.00
metal	53	1	0.00	0.00	4.55	94.50	288.60	1691.20	45100.00
glass	42	-	0.00	0.00	1.85	8.50	26.00	69.64	267.50
inert	46	-	0.00	0.56	18.58	35.80	51.70	99.70	227.00
mix	110	-	12.17	19.61	35.21	67.93	500.00	1154.99	4500.00
Grand Total	707	41							

*) number of data points

**) number of values below the detection limit

Value ranges for F



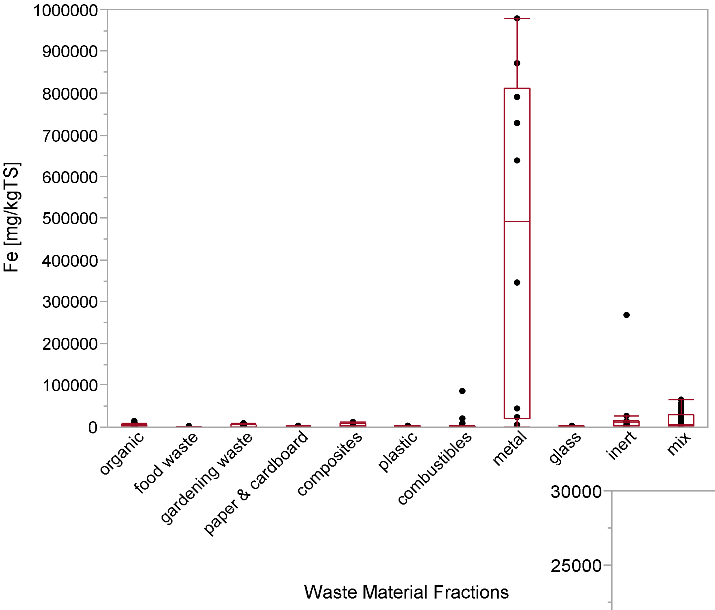


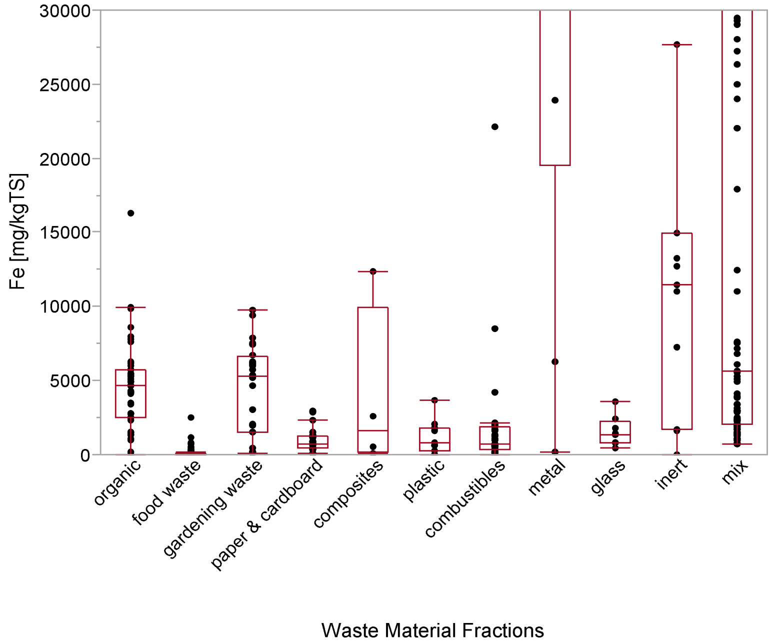
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	-	-	-	-	-	-	-	-	-
food waste	5	-	0.000%	0.000%	0.000%	0.000%	0.010%	0.010%	0.010%
gardening waste	16	12	0.000%	0.000%	0.010%	0.010%	0.010%	0.010%	0.010%
paper & cardboard	21	-	0.000%	0.000%	0.000%	0.010%	0.015%	0.036%	0.070%
composites	6	-	0.000%	0.000%	0.000%	0.002%	0.010%	0.010%	0.010%
plastic	14	-	0.000%	0.000%	0.000%	0.000%	0.010%	0.010%	0.010%
combustibles	25	-	0.000%	0.000%	0.000%	0.010%	0.010%	0.030%	0.058%
metal	17	-	0.000%	0.000%	0.000%	0.000%	0.000%	0.002%	0.010%
glass	6	-	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
inert	8	-	0.000%	0.000%	0.000%	0.006%	0.025%	0.087%	0.087%
mix	22	-	0.000%	0.002%	0.018%	0.030%	0.050%	0.200%	0.240%
Total	140	12							

*) number of data points
**) number of values below the detection limit

Value ranges for Fe





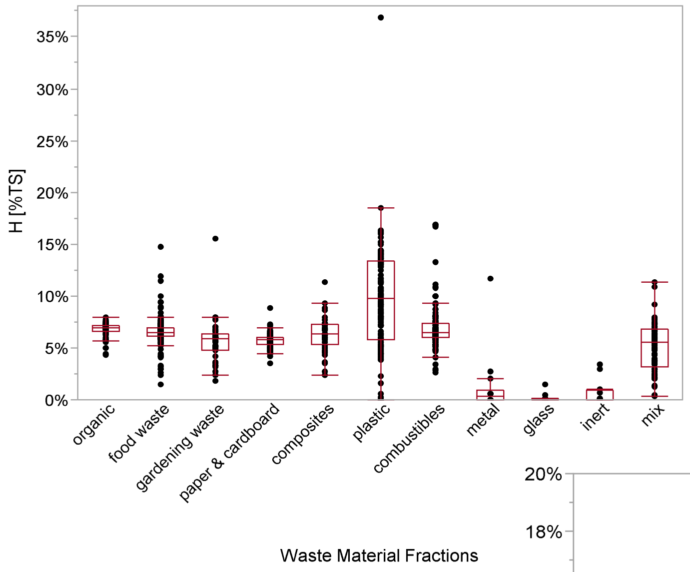
Quantiles [mg/kgTS]

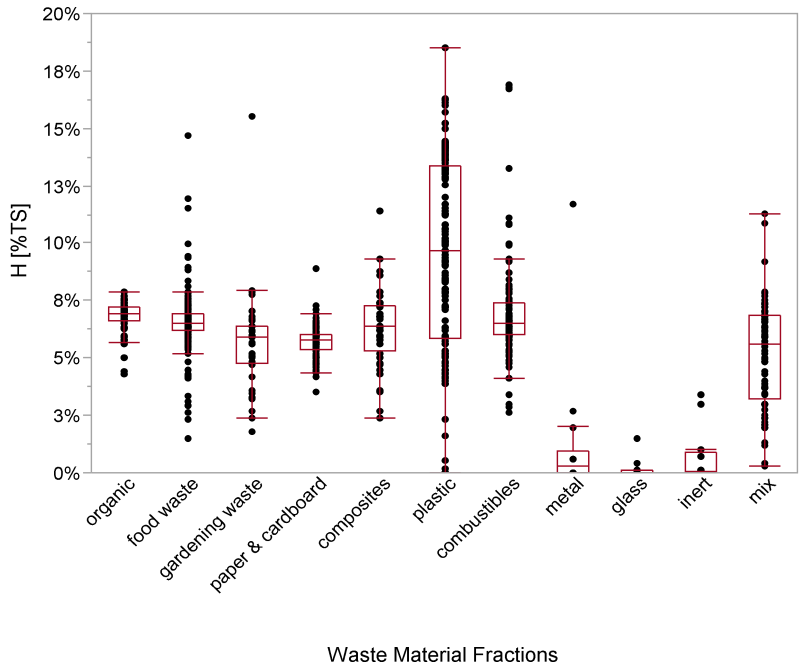
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	45	-	0	1220	2500	4700	5700	8240	16333
food waste	64	-	0	18	29	48	88	409	2478
gardening waste	24	-	76	168	1485	5270	6600	8643	9728
paper & cardboard	22	-	46	147	459	755	1245	2722	2940
composites	4	-	86	86	199	1585	9898	12320	12320
plastic	11	-	0	0	305	849	1830	3380	3700
combustibles	31	-	0	9	340	733	1850	7634	85100
metal	10	-	150	765	19500	492500	810750	969300	980000
glass	8	-	477	477	777	1350	2240	3567	3567
inert	11	-	0	320	1730	11500	14990	219940	268000
mix	82	-	684	1299	2017	5605	30819	49137	66000
Total	312	0							

*) number of data points

**) number of values below the detection limit

Value ranges for H





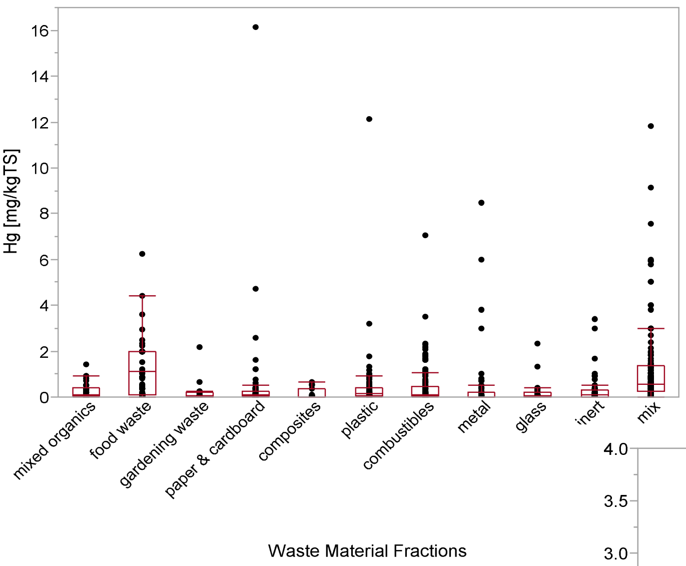
Quantiles [%TS]

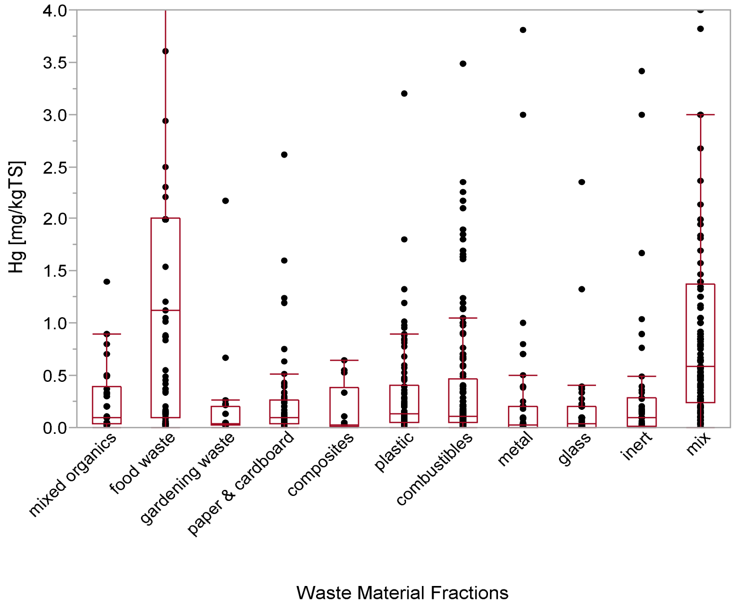
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	59	-	4.3%	5.7%	6.6%	6.9%	7.2%	7.5%	7.9%
food waste	173	-	1.5%	5.5%	6.2%	6.5%	6.9%	7.6%	14.7%
gardening waste	40	-	1.8%	3.2%	4.8%	5.9%	6.4%	7.7%	15.5%
paper & cardboard	112	-	3.5%	4.8%	5.4%	5.8%	6.0%	6.4%	8.9%
composites	40	-	2.4%	3.7%	5.3%	6.4%	7.3%	8.5%	11.4%
plastic	151	-	0.0%	3.9%	5.8%	9.7%	13.4%	14.4%	36.9%
combustibles	138	-	2.6%	5.3%	6.0%	6.5%	7.4%	9.3%	16.9%
metal	14	-	0.0%	0.0%	0.0%	0.3%	1.0%	7.2%	11.7%
glass	13	1	0.0%	0.0%	0.0%	0.0%	0.1%	1.1%	1.5%
inert	12	-	0.0%	0.0%	0.0%	0.1%	0.9%	3.3%	3.4%
mix	73	-	0.3%	2.0%	3.2%	5.6%	6.8%	7.5%	11.3%
Grand Total	825	1							

*) number of data points

**) number of values below the detection limit

Value ranges for Hg



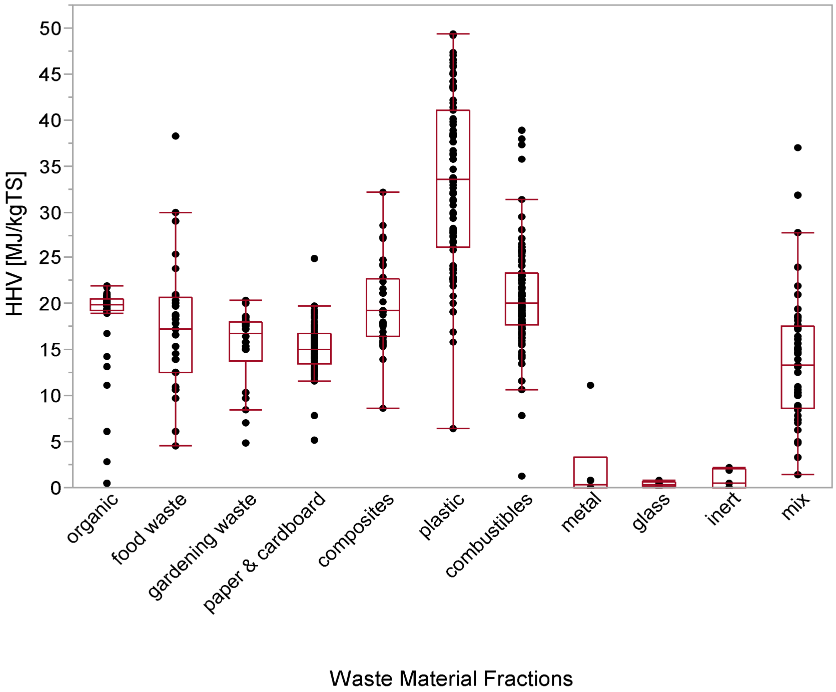


Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	34	4	0.000	0.020	0.040	0.100	0.396	0.850	1.400
food waste	99	41	0.000	0.020	0.100	1.120	2.000	2.000	6.250
*food waste -alt****	*59*	*1*	*0.000*	*0.000*	*0.040*	*0.140*	*0.870*	*2.310*	*6.250*
gardening waste	20	3	0.000	0.020	0.023	0.040	0.198	0.629	2.170
paper & cardboard	84	6	0.000	0.000	0.030	0.098	0.265	0.570	16.160
composites	14	-	0.000	0.000	0.008	0.025	0.380	0.595	0.640
plastic	89	3	0.000	0.000	0.045	0.130	0.400	0.891	12.150
combustibles	140	6	0.000	0.000	0.050	0.110	0.470	1.573	7.030
metal	60	5	0.000	0.000	0.000	0.025	0.200	0.790	8.500
glass	49	6	0.000	0.000	0.000	0.040	0.200	0.340	2.350
inert	49	5	0.000	0.000	0.015	0.100	0.285	0.900	3.420
mix	113	-	0.000	0.070	0.235	0.580	1.375	3.928	11.800
Grand Total	751	79							

*) number of data points
**) number of values below the detection limit
***) alternativ calculation excluding 55 data points from Wrap 2010, which were all below the same detection limit

Value ranges for HHV



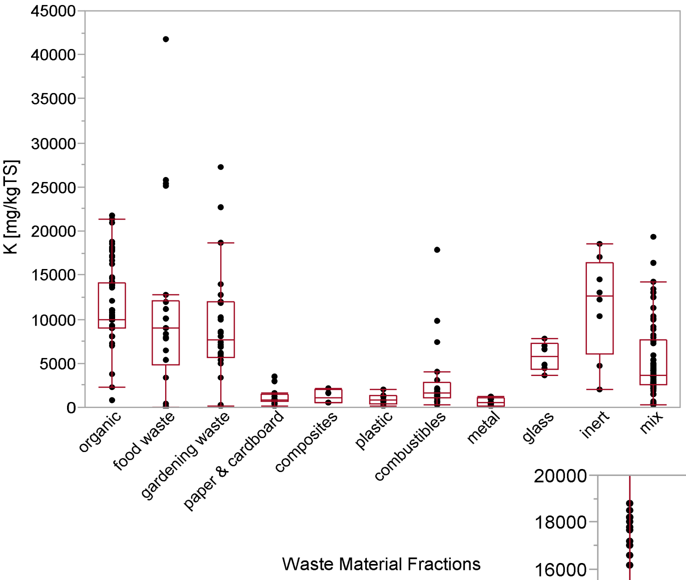
Quantiles [MJ/kgTS]

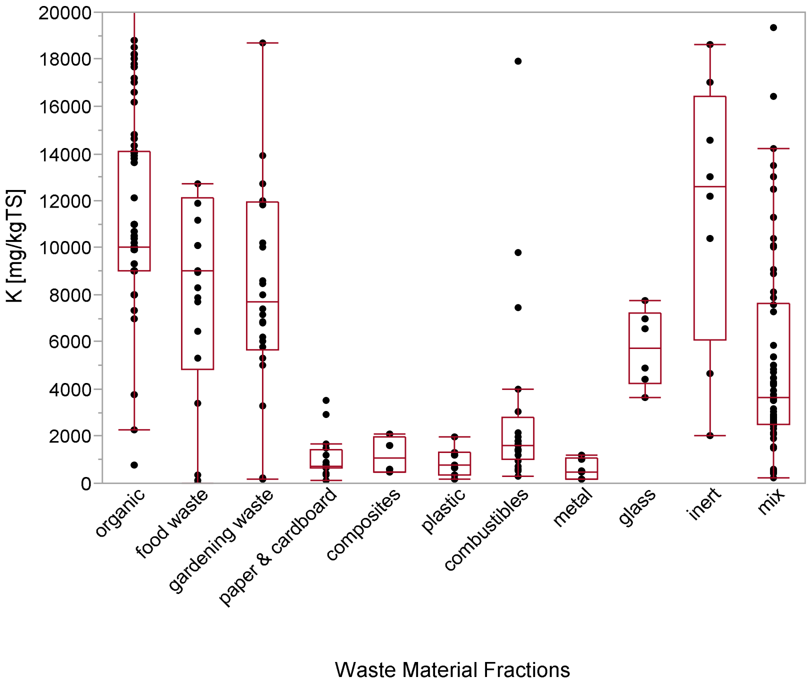
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	55	2	0.5	12.4	19.2	20.0	20.6	21.0	22.0
food waste	29	-	4.6	9.6	12.5	17.3	20.6	29.0	38.3
gardening waste	22	-	4.8	7.4	13.9	16.8	18.0	19.6	20.4
paper & cardboard	79	-	5.2	12.4	13.6	15.1	16.7	18.5	24.9
composites	36	-	8.6	15.4	16.4	19.2	22.8	27.2	32.2
plastic	91	-	6.5	22.4	26.1	33.5	41.0	45.7	49.4
combustibles	100	-	1.3	15.5	17.7	20.0	23.3	26.2	38.9
metal	6	-	0.0	0.0	0.0	0.4	3.3	11.1	11.1
glass	6	2	0.0	0.0	0.1	0.4	0.6	0.8	0.8
inert	5	1	0.0	0.0	0.0	0.5	2.0	2.2	2.2
mix	45	-	1.4	5.8	8.6	13.4	17.5	22.8	37.0
Total	474	5							

*) number of data points

**) number of values below the detection limit

Value ranges for K





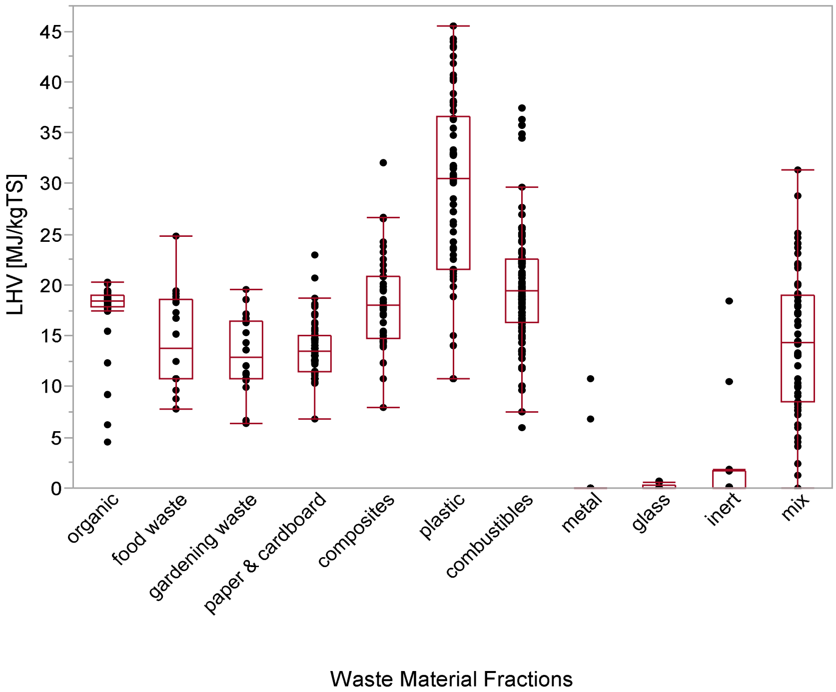
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	76	-	795	8000	9000	10000	14075	18060	21700
food waste	22	-	0	34	4850	8989	12100	25693	41800
gardening waste	26	-	161	216	5677	7695	11960	19900	27300
paper & cardboard	16	-	118	297	676	743	1430	3080	3500
composites	4	-	472	472	497	1096	1980	2100	2100
plastic	7	-	190	190	372	750	1300	1990	1990
combustibles	20	-	278	564	1016	1640	2803	9565	17900
metal	6	-	162	162	191	501	1045	1190	1190
glass	6	-	3650	3650	4237	5730	7195	7750	7750
inert	8	-	2010	2010	6110	12600	16408	18600	18600
mix	70	-	249	1484	2500	3622	7638	12497	19339
Total	261	0							

*) number of data points

**) number of values below the detection limit

Value ranges for LHV



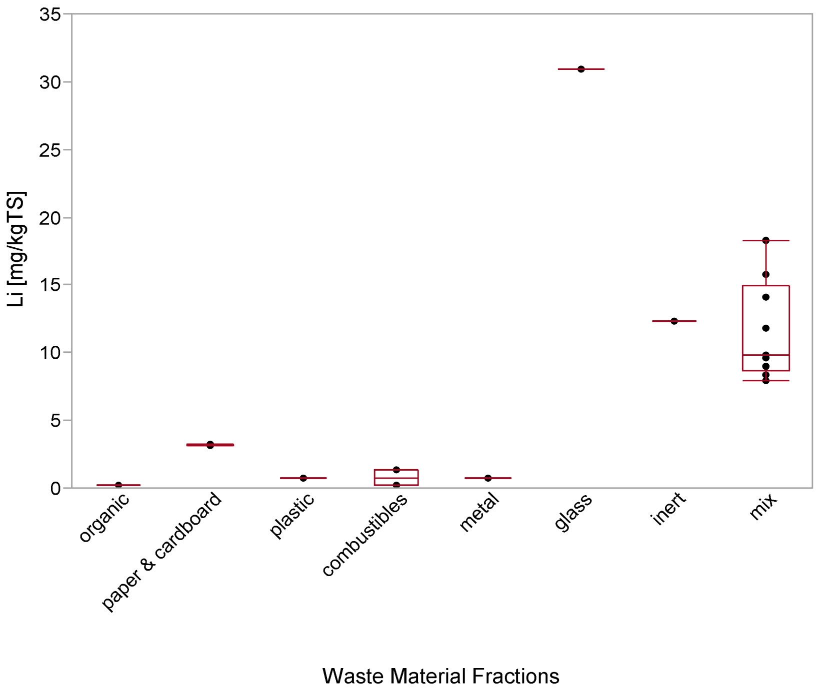
Quantiles [MJ/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	50	-	4.6	15.7	17.9	18.5	18.9	19.4	20.3
food waste	20	-	7.9	8.8	10.8	13.8	18.5	19.4	24.8
gardening waste	20	-	6.4	7.0	10.8	12.8	16.5	18.4	19.5
paper & cardboard	66	-	6.7	10.8	11.5	13.4	15.0	17.3	23.0
composites	39	-	7.9	13.9	14.7	18.0	20.9	24.2	32.1
plastic	74	-	10.8	12.4	21.5	30.5	36.6	42.2	45.5
combustibles	91	-	6.0	13.4	16.3	19.4	22.5	25.7	37.4
metal	11	-	-0.1	-0.1	0.0	0.0	0.0	9.9	10.7
glass	9	-	0.0	0.0	0.0	0.0	0.3	0.7	0.7
inert	12	-	0.0	0.0	0.0	0.0	1.8	16.1	18.5
mix	57	-	0.0	4.9	8.5	14.4	19.0	24.1	31.3
Total	449	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Li



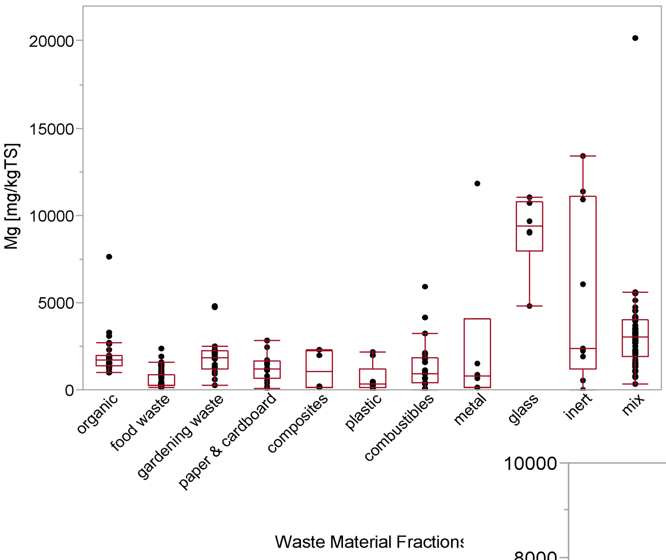
Quantiles [mg/kgTS]

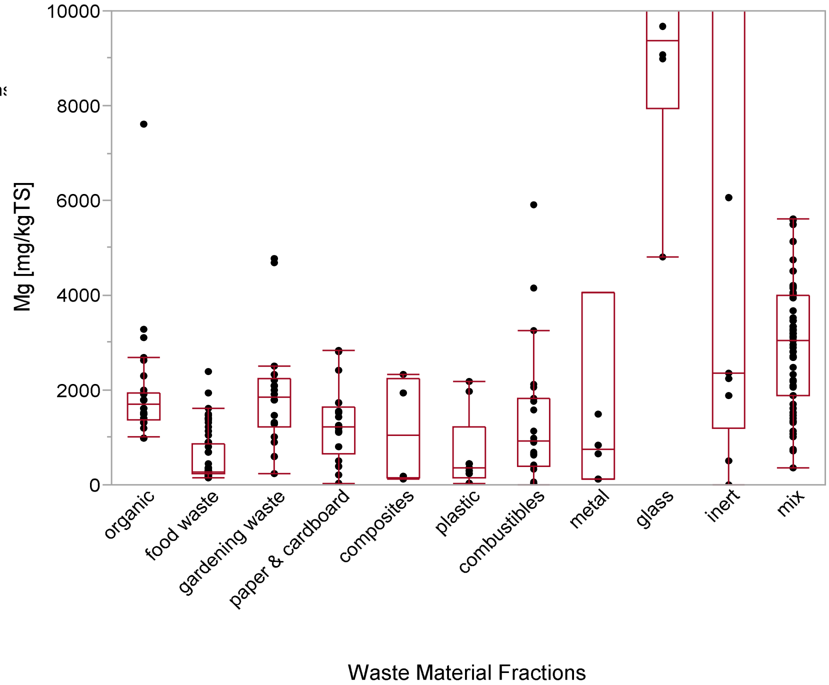
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20
food waste	-	-	-	-	-	-	-	-	-
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	2	-	3.14	3.14	3.14	3.18	3.22	3.22	3.22
composites	-	-	-	-	-	-	-	-	-
plastic	1	-	0.69	0.69	0.69	0.69	0.69	0.69	0.69
combustibles	2	1	0.20	0.20	0.20	0.77	1.33	1.33	1.33
metal	1	1	0.70	0.70	0.70	0.70	0.70	0.70	0.70
glass	1	-	30.90	30.90	30.90	30.90	30.90	30.90	30.90
inert	1	-	12.30	12.30	12.30	12.30	12.30	12.30	12.30
mix	9	-	7.89	7.89	8.70	9.86	14.94	18.31	18.31
Total	18	3							

*) number of data points

**) number of values below the detection limit

Value ranges for Mg





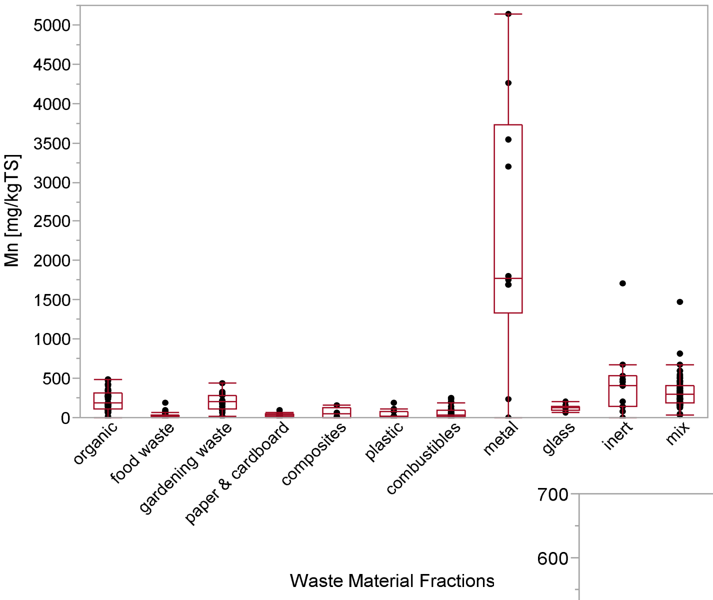
Quantiles [mg/kgTS]

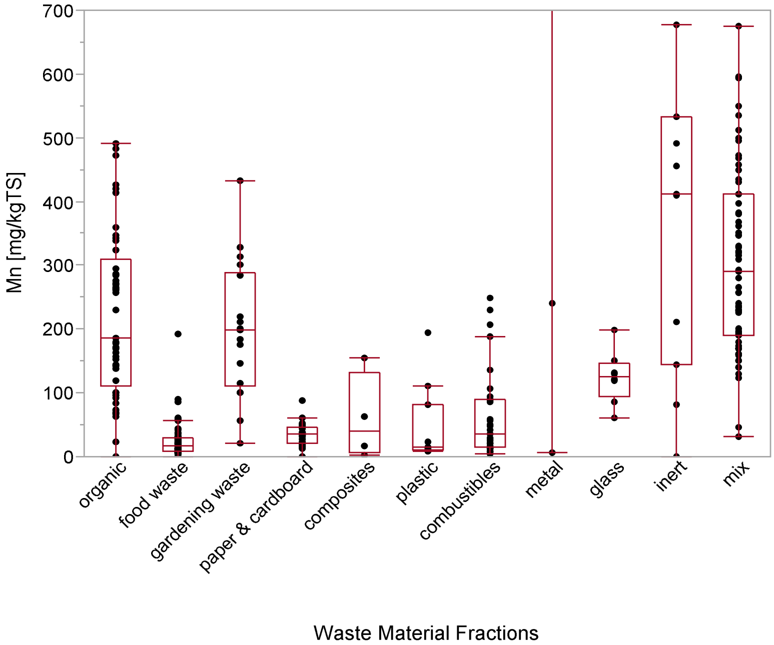
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	30	-	1000	1020	1375	1695	1949	3060	7598
food waste	60	-	136	188	236	274	881	1400	2386
gardening waste	18	-	239	564	1209	1850	2230	4708	4780
paper & cardboard	17	-	43	169	651	1210	1645	2817	2845
composites	4	-	127	127	140	1060	2233	2330	2330
plastic	9	-	19	19	142	344	1213	2170	2170
combustibles	23	-	13	21	375	917	1820	3792	5920
metal	6	-	105	105	119	756	4060	11800	11800
glass	6	-	4800	4800	7949	9370	10780	11020	11020
inert	9	-	0	0	1200	2350	11125	13400	13400
mix	55	-	345	1117	1874	3039	4000	4903	20160
Total	237	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Mn



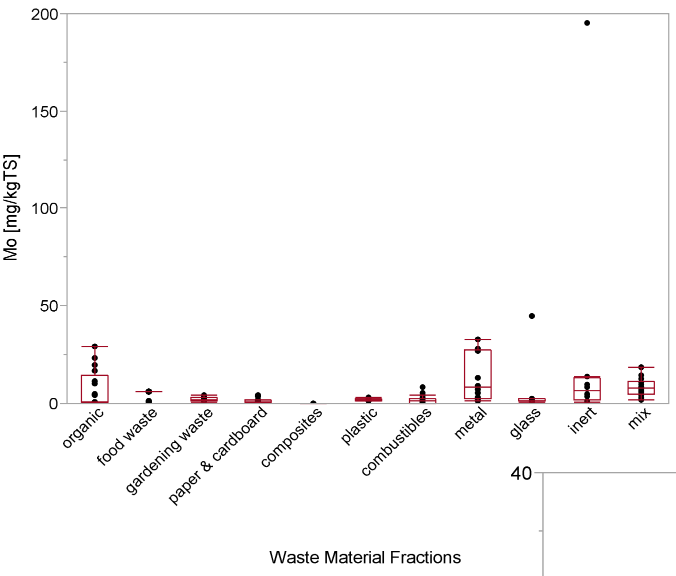


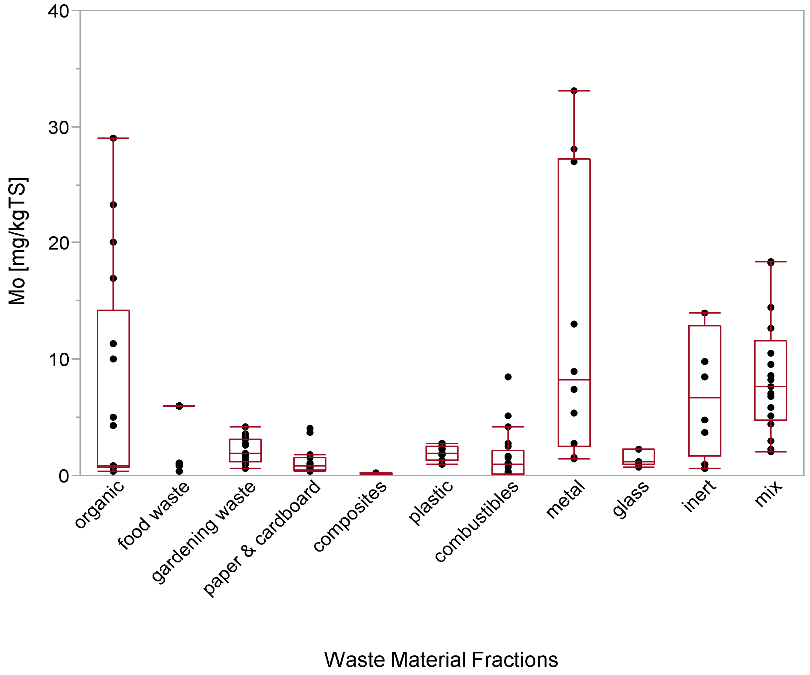
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	45	-	0.0	67.8	110.7	185.5	308.6	422.2	490.6
food waste	58	-	0.0	5.9	9.2	16.5	28.4	56.0	193.0
gardening waste	18	-	21.6	52.6	111.3	198.6	287.9	338.9	433.0
paper & cardboard	22	-	0.0	13.2	20.3	34.7	45.3	58.3	88.2
composites	4	-	2.2	2.2	5.7	39.5	132.0	155.0	155.0
plastic	11	-	7.7	7.7	10.0	14.0	82.0	178.2	195.0
combustibles	31	-	4.8	8.1	15.0	36.0	89.0	202.6	248.0
metal	10	-	6.3	29.7	1327.5	1775.0	3722.5	5053.0	5140.0
glass	8	-	61.0	61.0	93.8	125.5	145.3	199.0	199.0
inert	11	-	0.0	16.4	145.0	412.0	532.0	1503.4	1710.0
mix	68	-	30.9	149.0	190.2	290.2	412.0	536.7	1476.0
Total	163	55							

*) number of data points
**) number of values below the detection limit

Value ranges for Mo





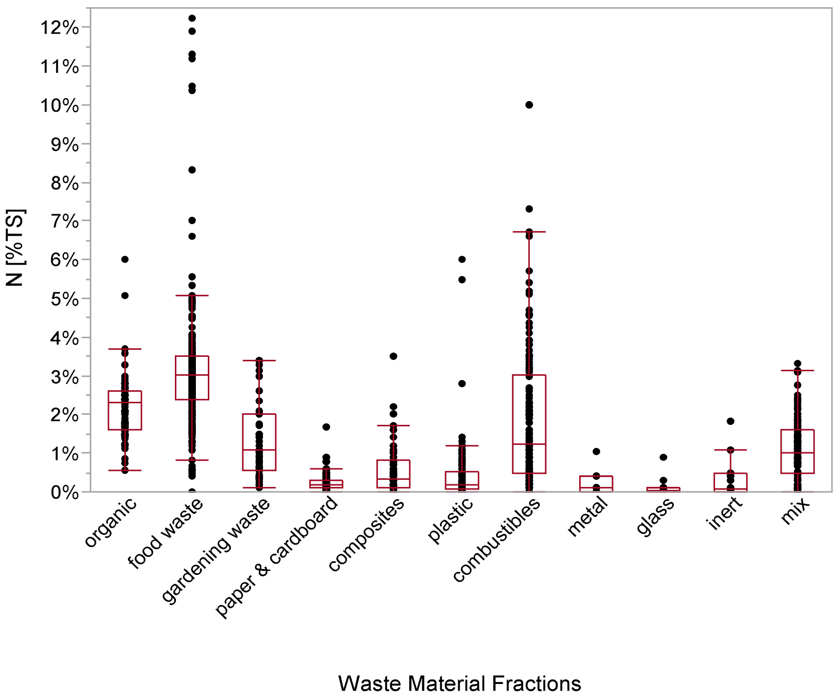
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	17	-	0.34	0.60	0.75	0.81	14.15	24.44	29.00
food waste	44	41	0.30	3.55	6.00	6.00	6.00	6.00	6.00
gardening waste	15	4	0.65	0.86	1.20	1.89	3.06	3.82	4.17
paper & cardboard	15	1	0.32	0.40	0.50	0.79	1.50	3.86	4.10
composites	2	-	0.11	0.11	0.11	0.15	0.19	0.19	0.19
plastic	7	-	0.92	0.92	1.30	1.95	2.50	2.80	2.80
combustibles	21	5	0.12	0.13	0.17	1.00	2.10	4.92	8.50
metal	10	2	1.40	1.42	2.50	8.20	27.25	32.59	33.10
glass	7	1	0.75	0.75	1.00	1.20	2.30	45.00	45.00
inert	8	1	0.54	0.54	1.68	6.67	12.95	195.00	195.00
mix	17	-	2.00	2.18	4.75	7.70	11.61	18.33	18.42
Total	163	55							

*) number of data points

**) number of values below the detection limit

Value ranges for N



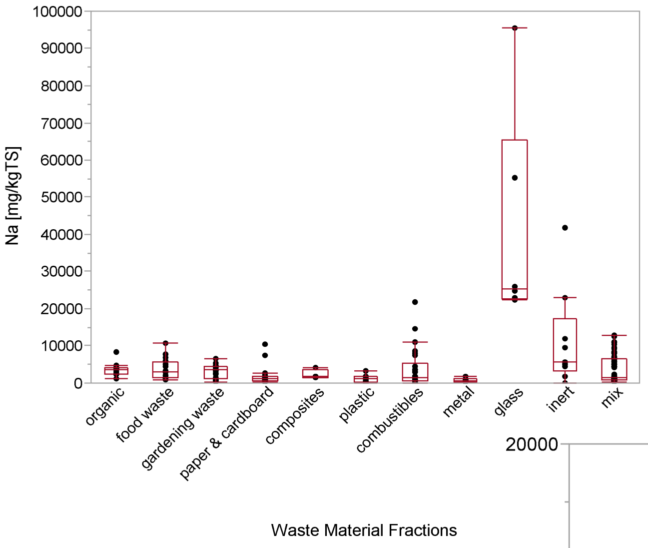
Quantiles [%TS]

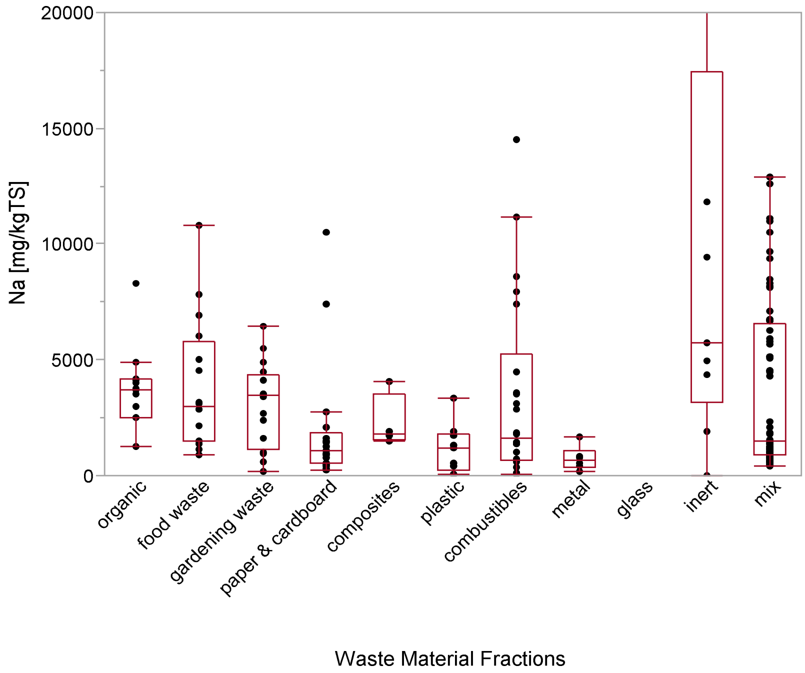
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	104	-	0.56%	1.40%	1.61%	2.30%	2.60%	2.80%	6.00%
food waste	212	-	0.00%	1.59%	2.39%	3.01%	3.50%	4.55%	12.23%
gardening waste	49	-	0.10%	0.33%	0.57%	1.09%	2.00%	3.40%	3.40%
paper & cardboard	114	1	0.00%	0.09%	0.10%	0.20%	0.30%	0.49%	1.69%
composites	42	-	0.00%	0.00%	0.12%	0.35%	0.83%	1.67%	3.50%
plastic	116	1	0.00%	0.00%	0.06%	0.20%	0.53%	1.03%	6.00%
combustibles	146	-	0.00%	0.18%	0.47%	1.22%	3.03%	4.60%	10.00%
metal	13	3	0.00%	0.00%	0.00%	0.10%	0.40%	1.05%	1.05%
glass	13	3	0.00%	0.00%	0.00%	0.04%	0.10%	0.65%	0.88%
inert	14	-	0.00%	0.00%	0.00%	0.08%	0.50%	1.46%	1.81%
mix	117	-	0.00%	0.12%	0.48%	1.05%	1.67%	2.33%	13.16%
Total	940	8							

*) number of data points

**) number of values below the detection limit

Value ranges for Na





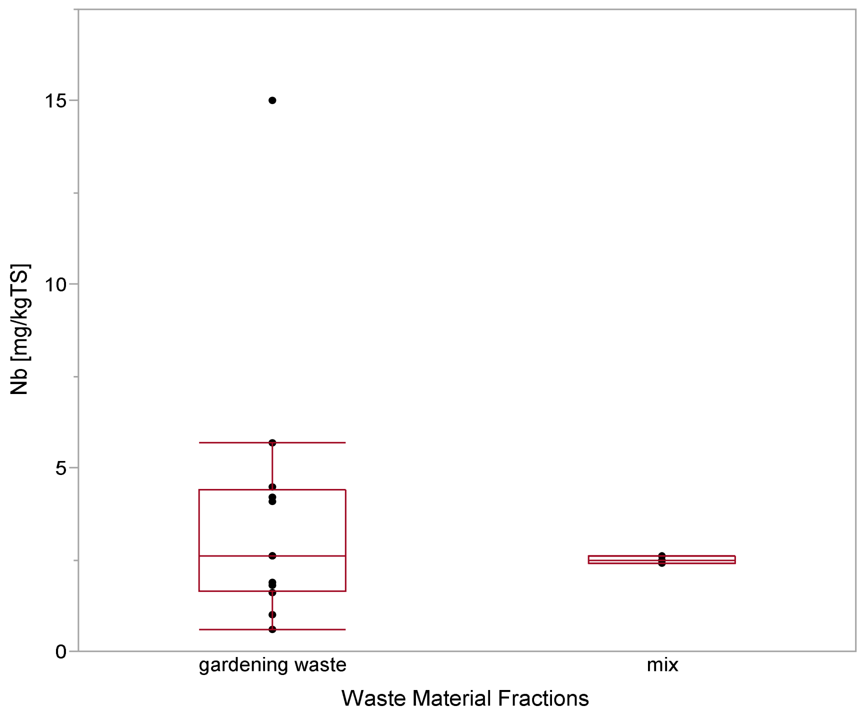
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	13	-	1250	1750	2500	3720	4150	6940	8300
food waste	16	-	877	1058	1483	2980	5767	8729	10800
gardening waste	16	-	168	470	1150	3441	4375	5782	6423
paper & cardboard	17	-	246	272	511	1090	1835	8020	10500
composites	4	-	1500	1500	1560	1820	3520	4060	4060
plastic	9	-	36	36	250	1170	1810	3340	3340
combustibles	26	-	39	52	671	1630	5225	12162	21900
metal	6	-	165	165	334	648	1054	1670	1670
glass	6	-	22400	22400	22820	25500	65343	95500	95500
inert	9	-	0	0	3135	5760	17411	41700	41700
mix	64	-	437	605	890	1502	6580	9534	12876
Total	186	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Nb



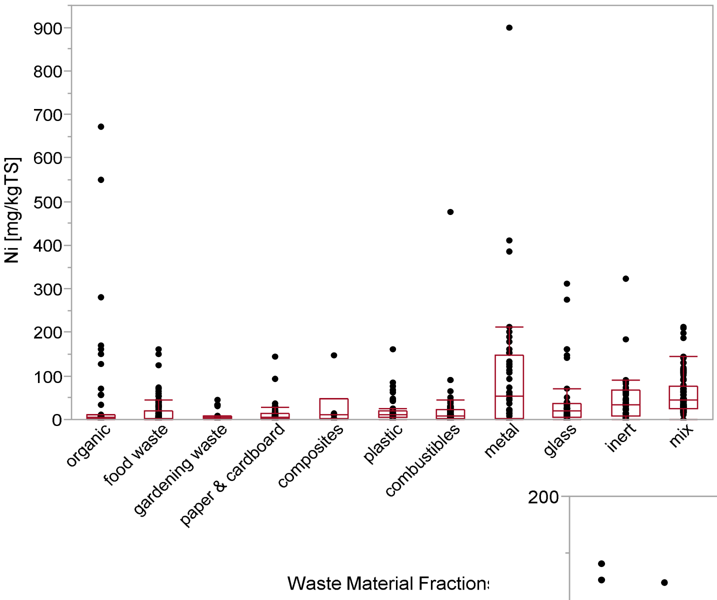
Quantiles [mg/kgTS]

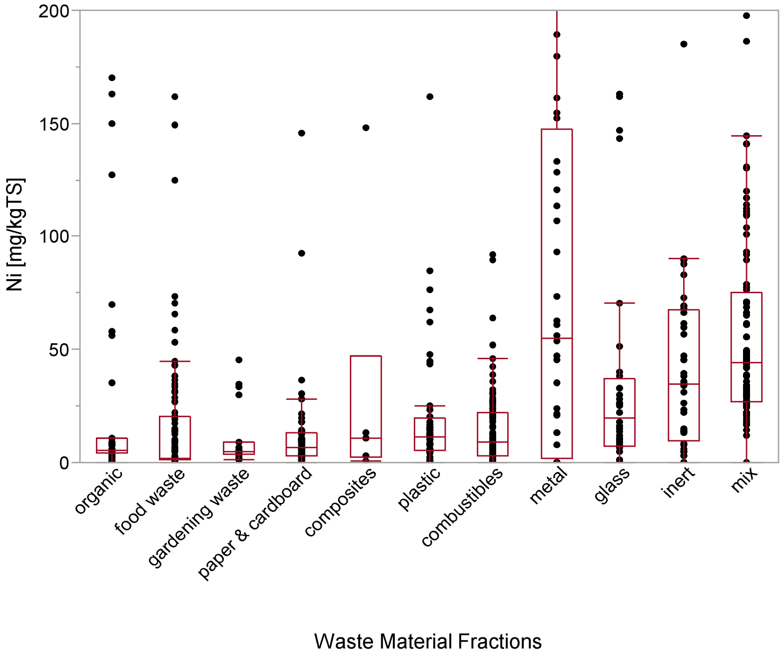
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	-	-	-	-	-	-	-	-	-
food waste	-	-	-	-	-	-	-	-	-
gardening waste	12	11	0.600	0.720	1.650	2.600	4.425	12.210	15.000
paper & cardboard	-	-	-	-	-	-	-	-	-
composites	-	-	-	-	-	-	-	-	-
plastic	-	-	-	-	-	-	-	-	-
combustibles	-	-	-	-	-	-	-	-	-
metal	-	-	-	-	-	-	-	-	-
glass	-	-	-	-	-	-	-	-	-
inert	-	-	-	-	-	-	-	-	-
mix	3	-	2.400	2.400	2.400	2.500	2.600	2.600	2.600
Total	15	11							

*) number of data points

**) number of values below the detection limit

Value ranges for Ni





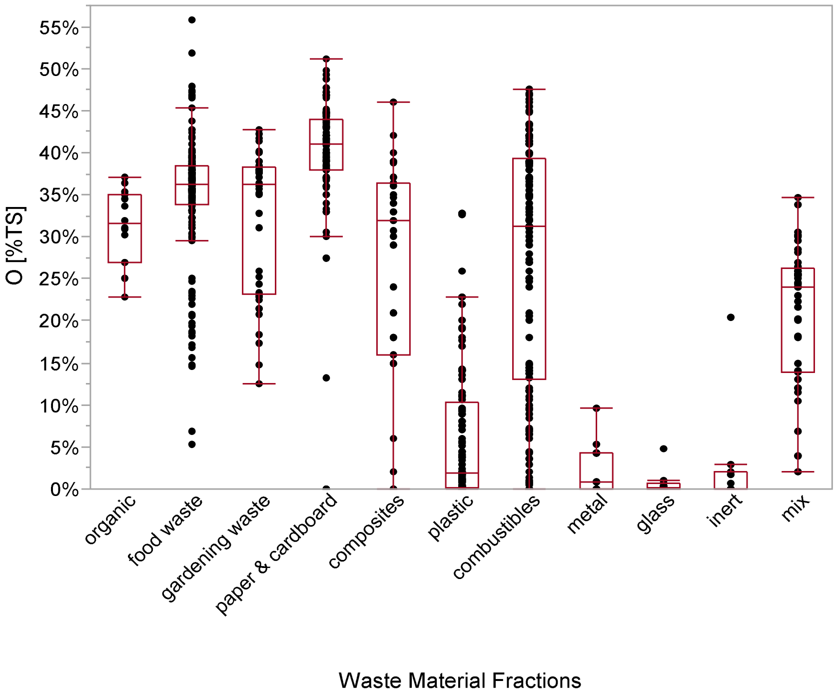
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	51	-	0.0	2.3	3.9	5.6	10.5	160.4	673.0
food waste	99	24	0.0	1.0	1.0	2.0	20.4	44.9	162.0
gardening waste	20	-	1.0	1.6	3.5	4.8	9.0	34.6	45.6
paper & cardboard	57	2	0.0	0.9	3.2	6.5	13.3	28.0	145.6
composites	6	-	0.5	0.5	2.2	10.8	47.1	148.3	148.3
plastic	44	-	0.0	0.2	5.4	11.6	19.6	64.9	161.8
combustibles	97	-	0.0	0.0	3.2	8.8	22.0	33.2	476.0
metal	40	-	0.0	0.0	2.0	55.0	147.3	211.4	900.0
glass	40	-	0.0	0.0	6.9	19.9	37.1	160.5	313.0
inert	44	-	0.0	1.6	9.3	34.7	67.7	89.3	322.0
mix	104	-	0.0	20.5	26.8	44.2	75.2	118.5	211.3
Total	602	26							

*) number of data points

**) number of values below the detection limit

Value ranges for O



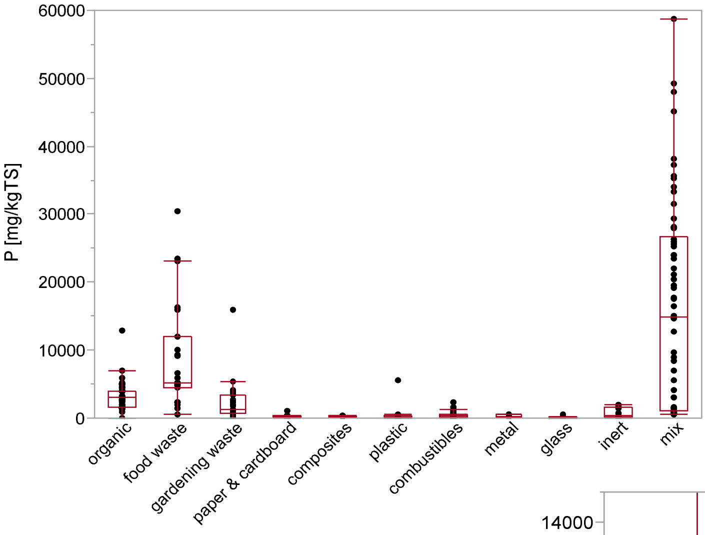
Quantiles [%TS]

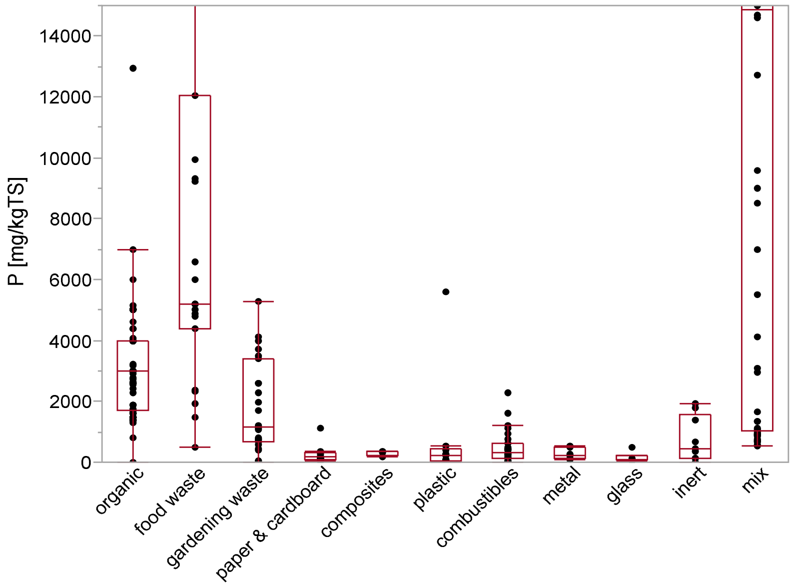
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	14	-	22.9%	24.0%	26.9%	31.5%	35.1%	36.7%	37.0%
food waste	173	-	5.3%	23.1%	33.8%	36.2%	38.5%	40.7%	55.8%
gardening waste	40	-	12.6%	18.6%	23.1%	36.2%	38.2%	41.2%	42.7%
paper & cardboard	112	-	0.0%	32.9%	38.0%	41.1%	44.0%	46.8%	51.2%
composites	39	-	0.0%	0.0%	16.0%	32.0%	36.4%	40.0%	46.0%
plastic	112	-	0.0%	0.0%	0.2%	1.9%	10.3%	19.1%	32.8%
combustibles	130	-	0.0%	3.7%	13.0%	31.3%	39.2%	42.7%	47.6%
metal	13	-	0.0%	0.0%	0.0%	0.8%	4.3%	7.9%	9.6%
glass	12	-	0.0%	0.0%	0.0%	0.2%	0.6%	3.7%	4.8%
inert	11	-	0.0%	0.0%	0.0%	0.0%	2.0%	17.0%	20.5%
mix	43	-	2.0%	5.1%	13.8%	24.0%	26.3%	30.2%	34.6%
Total	699	0							

*) number of data points

**) number of values below the detection limit

Value ranges for P





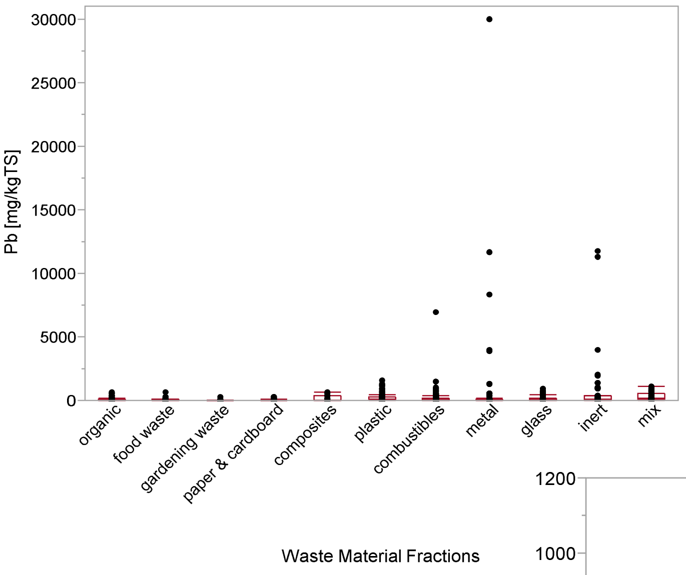
Quantiles [mg/kgTS]

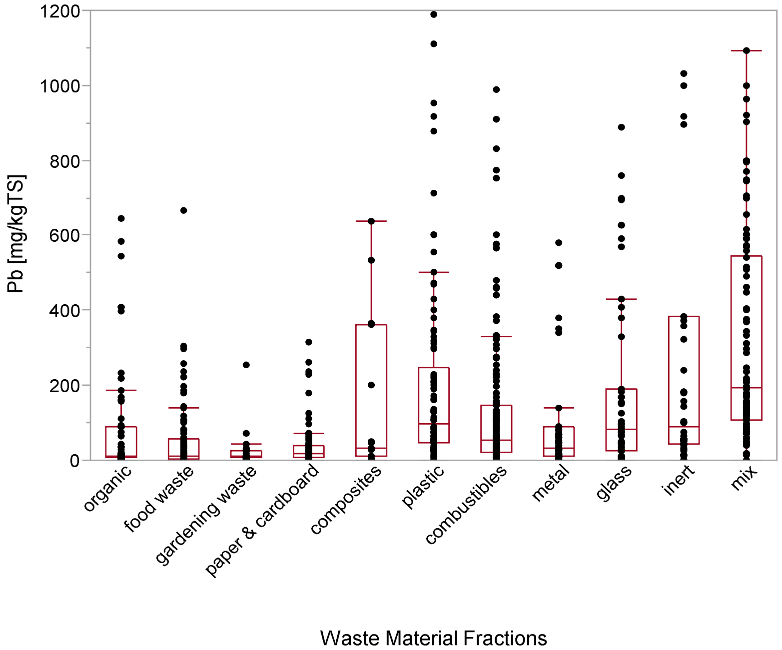
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	85	-	5	1438	1700	3000	4000	5000	12950
food waste	23	-	489	1659	4400	5200	12045	23386	30455
gardening waste	27	-	21	28	666	1184	3400	4340	15900
paper & cardboard	18	-	38	43	109	164	291	422	1100
composites	4	-	189	189	224	340	373	380	380
plastic	10	-	15	16	63	244	445	5104	5610
combustibles	27	-	13	30	148	300	608	1294	2300
metal	6	-	110	110	139	232	498	551	551
glass	6	1	64	64	70	98	212	480	480
inert	9	-	0	0	141	439	1585	1920	1920
mix	62	-	550	736	1051	14850	26725	36750	58800
Total	277	1							

*) number of data points

**) number of values below the detection limit

Value ranges for Pb





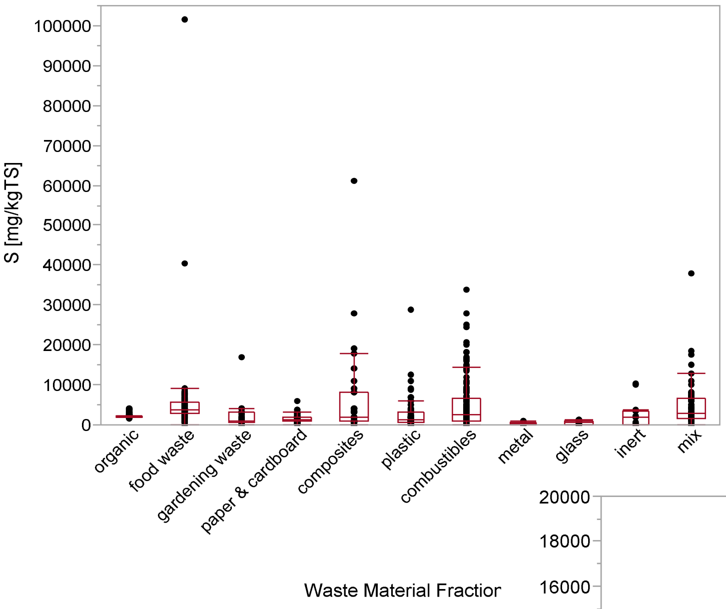
Quantiles [mg/kgTS]

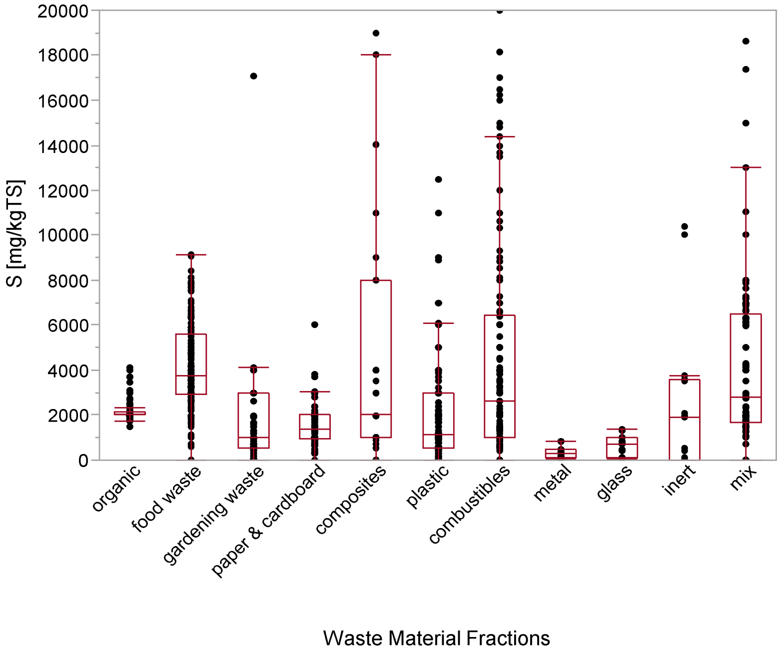
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	68	-	0.0	3.4	6.7	10.7	89.1	250.3	643.2
food waste	105	40	0.0	2.0	2.0	11.0	56.9	157.6	666.9
gardening waste	25	-	0.0	2.0	6.7	9.6	23.7	54.8	255.3
paper & cardboard	88	2	0.0	2.7	7.6	17.4	39.8	74.4	316.0
composites	15	-	0.7	1.0	9.0	34.0	363.3	575.2	638.0
plastic	102	-	0.8	21.9	46.6	98.2	247.0	602.0	1595.0
combustibles	155	3	0.0	9.1	23.0	53.8	147.0	405.2	6900.0
metal	67	1	0.0	0.0	9.0	33.0	90.0	1283.2	30010.0
glass	51	-	0.0	0.0	24.6	81.5	189.1	628.0	889.0
inert	50	-	0.0	13.1	41.3	88.4	382.3	1910.5	11740.0
mix	102	3	0.0	47.4	107.1	191.9	544.6	764.0	1092.1
Total	828	49							

*) number of data points

**) number of values below the detection limit

Value ranges for S





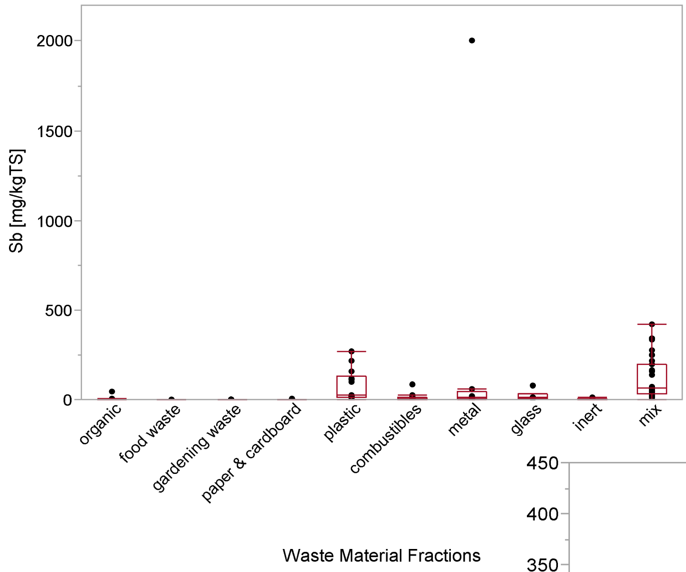
Quantiles [mg/kgTS]

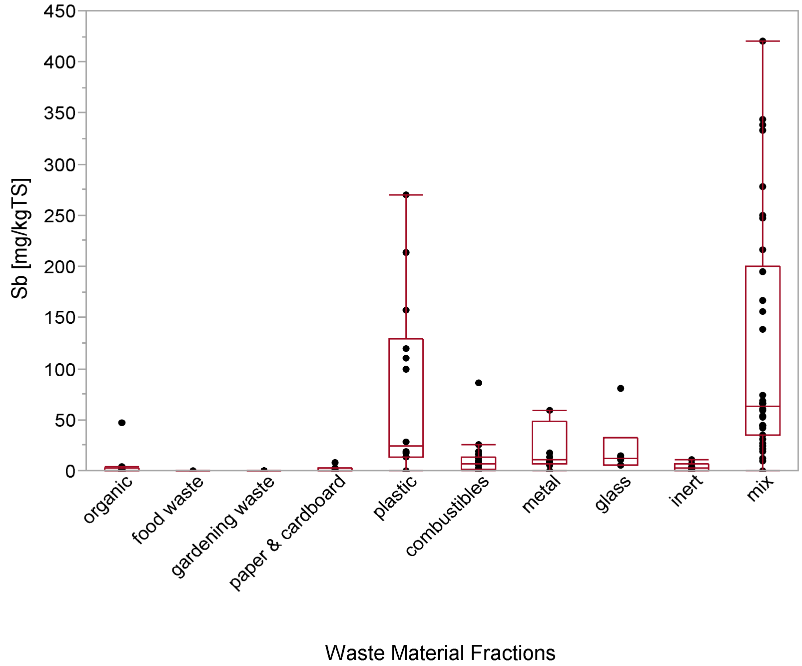
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	67	-	1500	1888	2000	2000	2170	3020	4100
food waste	175	-	0	1960	2900	3780	5600	7510	101700
gardening waste	39	-	0	51	557	1000	3000	4000	17065
paper & cardboard	81	-	0	526	944	1400	2000	3000	6000
composites	37	-	0	0	1000	2000	8000	18200	61000
plastic	101	2	0	0	520	1125	3000	6000	28740
combustibles	142	3	0	587	1000	2600	6428	14654	34000
metal	13	2	30	30	95	297	500	808	808
glass	11	-	50	58	111	687	1000	1383	1400
inert	15	-	0	0	0	1920	3590	10164	10410
mix	85	-	0	419	1694	2800	6490	8006	38000
Total	766	7							

*) number of data points

**) number of values below the detection limit

Value ranges for Sb





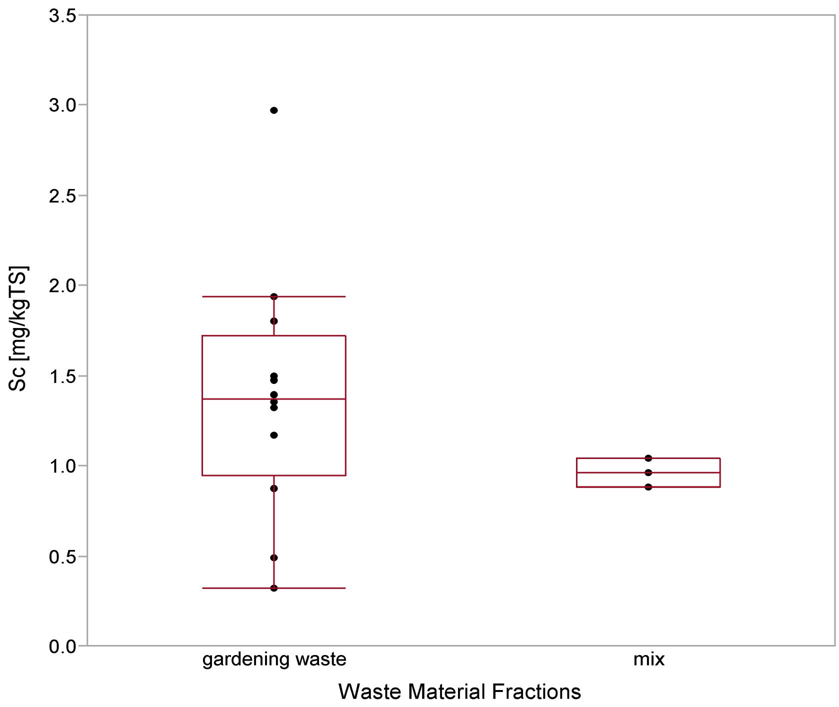
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	12	5	0.02	0.16	0.50	0.60	2.60	34.04	47.00
food waste	2	1	0.00	0.00	0.00	0.25	0.50	0.50	0.50
gardening waste	13	4	0.00	0.00	0.00	0.04	0.11	0.18	0.20
paper & cardboard	8	2	0.00	0.00	0.20	0.56	2.45	7.90	7.90
composites	-	-	-	-	-	-	-	-	-
plastic	14	-	0.00	0.00	12.88	24.00	129.23	242.18	270.60
combustibles	23	-	0.00	0.00	0.90	6.20	13.00	22.68	86.30
metal	8	1	0.50	0.50	6.45	11.40	48.73	2000.00	2000.00
glass	6	-	5.90	5.90	5.98	12.28	31.70	81.20	81.20
inert	7	1	0.00	0.00	0.50	2.70	6.07	11.10	11.10
mix	34	-	0.00	15.16	34.28	62.90	200.10	336.00	420.00
Total	127	14							

*) number of data points

**) number of values below the detection limit

Value ranges for Sc



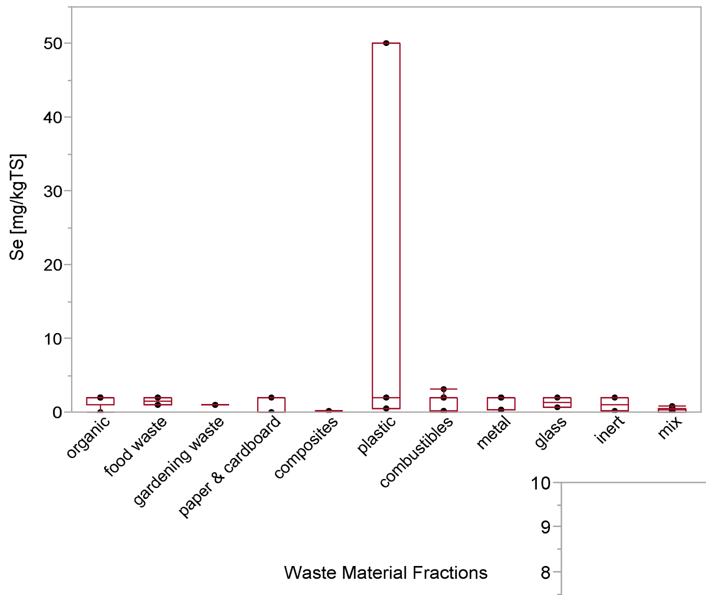
Quantiles [mg/kgTS]

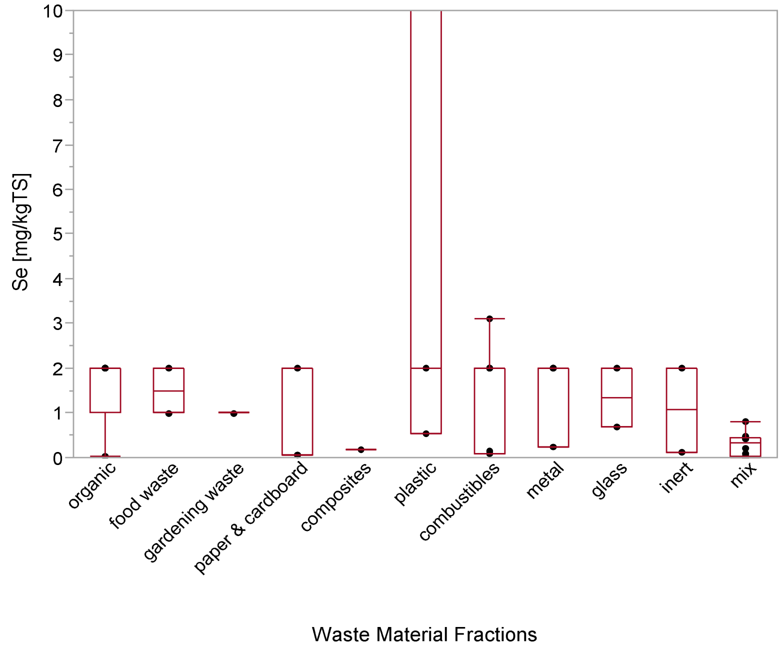
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	-	-	-	-	-	-	-	-	-
food waste	-	-	-	-	-	-	-	-	-
gardening waste	12		0.32	0.37	0.95	1.37	1.73	2.66	2.97
paper & cardboard	-	-	-	-	-	-	-	-	-
composites	-	-	-	-	-	-	-	-	-
plastic	-	-	-	-	-	-	-	-	-
combustibles	-	-	-	-	-	-	-	-	-
metal	-	-	-	-	-	-	-	-	-
glass	-	-	-	-	-	-	-	-	-
inert	-	-	-	-	-	-	-	-	-
mix	3		0.88	0.88	0.88	0.96	1.04	1.04	1.04
Total	15	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Se





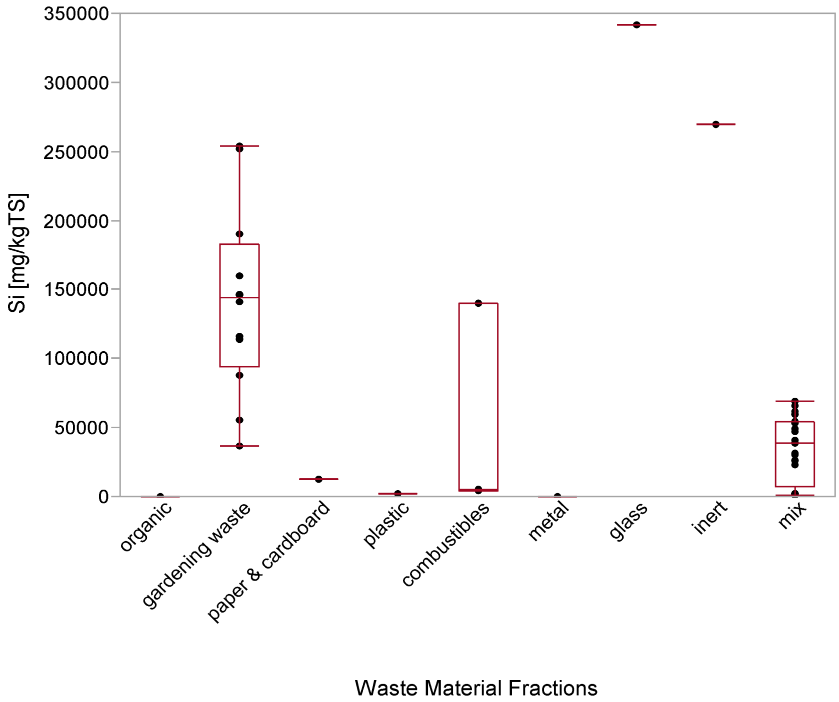
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	5	4	0.04	0.04	1.02	2.00	2.00	2.00	2.00
food waste	2	2	1.00	1.00	1.00	1.50	2.00	2.00	2.00
gardening waste	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00
paper & cardboard	3	1	0.06	0.06	0.06	0.07	2.00	2.00	2.00
composites	1	-	0.17	0.17	0.17	0.17	0.17	0.17	0.17
plastic	3	2	0.55	0.55	0.55	2.00	50.00	50.00	50.00
combustibles	7	3	0.08	0.08	0.10	2.00	2.00	3.10	3.10
metal	3	2	0.25	0.25	0.25	2.00	2.00	2.00	2.00
glass	2	1	0.69	0.69	0.69	1.35	2.00	2.00	2.00
inert	2	1	0.12	0.12	0.12	1.06	2.00	2.00	2.00
mix	10	-	0.00	0.00	0.02	0.32	0.46	0.77	0.80
Total	39	17							

*) number of data points

**) number of values below the detection limit

Value ranges for Si



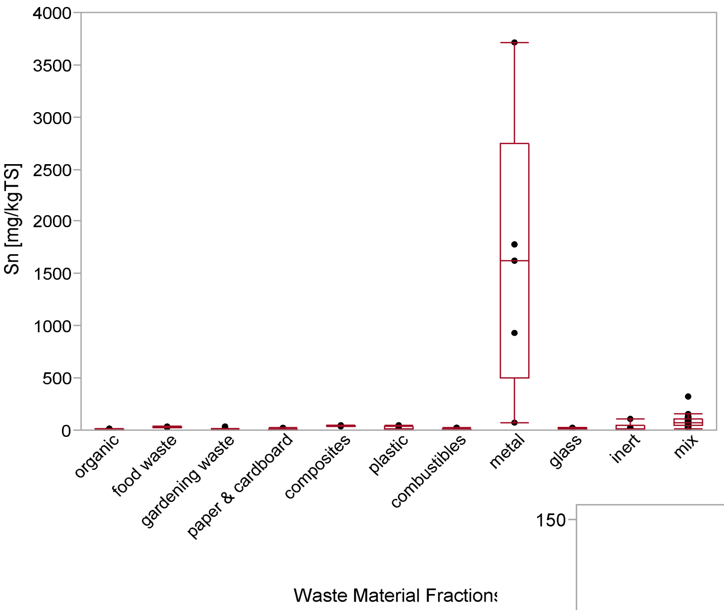
Quantiles [mg/kgTS]

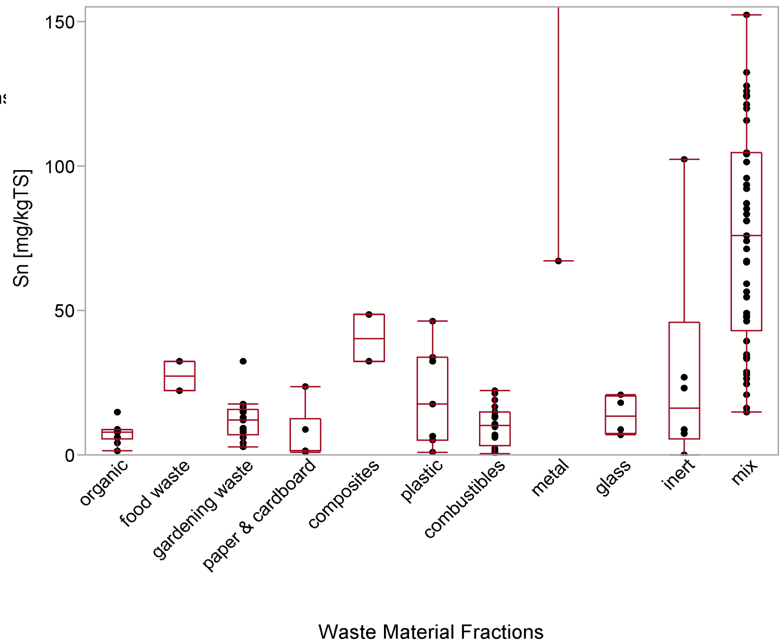
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	-	488	488	488	488	488	488	488
food waste	-	-	-	-	-	-	-	-	-
gardening waste	12	-	37000	42400	94283	143733	182500	253663	254393
paper & cardboard	2	-	12200	12200	12200	12400	12600	12600	12600
composites	-	-	-	-	-	-	-	-	-
plastic	1	-	1670	1670	1670	1670	1670	1670	1670
combustibles	3	-	3980	3980	3980	5110	140000	140000	140000
metal	1	-	168	168	168	168	168	168	168
glass	1	-	342000	342000	342000	342000	342000	342000	342000
inert	1	-	270000	270000	270000	270000	270000	270000	270000
mix	24	-	1447	1700	7443	38579	54480	64099	69200
Total	46	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Sn





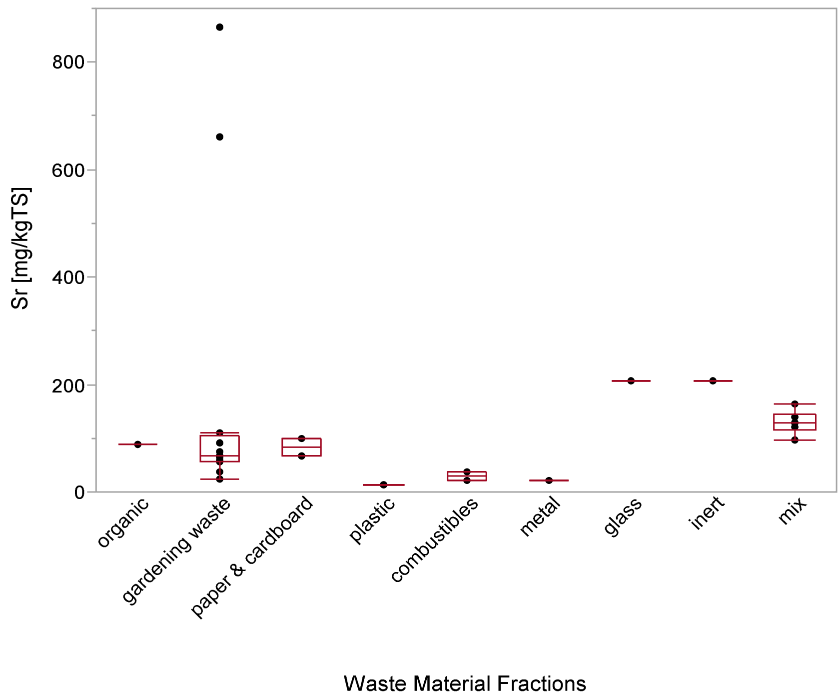
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	10	-	1.2	1.5	5.6	8.0	8.9	14.1	14.7
food waste	2	-	22.0	22.0	22.0	27.3	32.5	32.5	32.5
gardening waste	13	4	3.0	3.4	7.1	12.0	15.9	26.4	32.2
paper & cardboard	6	1	1.0	1.0	1.2	1.4	12.6	23.5	23.5
composites	2	-	32.3	32.3	32.3	40.4	48.5	48.5	48.5
plastic	7	1	0.9	0.9	5.0	17.7	34.0	46.4	46.4
combustibles	20	2	0.6	1.0	3.4	10.3	14.7	21.2	22.4
metal	5	1	67.0	67.0	498.5	1620.0	2745.0	3710.0	3710.0
glass	4	-	7.1	7.1	7.5	13.5	20.3	21.0	21.0
inert	6	-	0.0	0.0	5.6	16.0	45.9	102.4	102.4
mix	45	-	15.0	25.6	42.9	76.1	104.4	126.5	321.0
Total	120	9							

*) number of data points

**) number of values below the detection limit

Value ranges for Sr



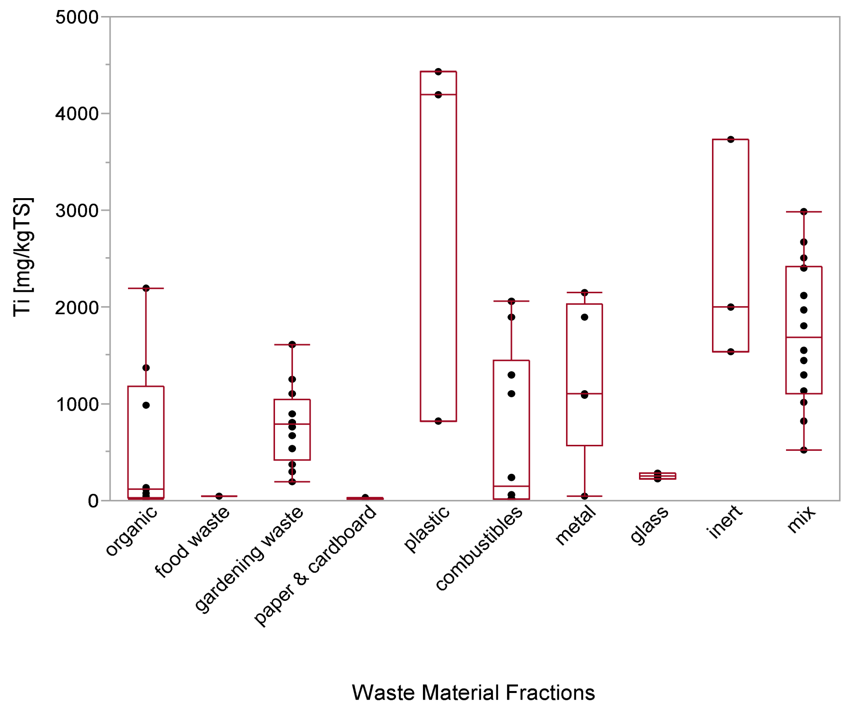
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	-	88.1	88.1	88.1	88.1	88.1	88.1	88.1
food waste	-	-	-	-	-	-	-	-	-
gardening waste	12	-	25.0	28.6	56.9	67.6	104.9	803.1	864.0
paper & cardboard	2	-	68.5	68.5	68.5	83.5	98.4	98.4	98.4
composites	-	-	-	-	-	-	-	-	-
plastic	1	-	13.3	13.3	13.3	13.3	13.3	13.3	13.3
combustibles	2	-	20.9	20.9	20.9	29.0	37.0	37.0	37.0
metal	1	-	21.5	21.5	21.5	21.5	21.5	21.5	21.5
glass	1	-	208.0	208.0	208.0	208.0	208.0	208.0	208.0
inert	1	-	208.0	208.0	208.0	208.0	208.0	208.0	208.0
mix	6	-	97.0	97.0	115.0	130.0	145.0	163.0	163.0
Total	27	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Ti



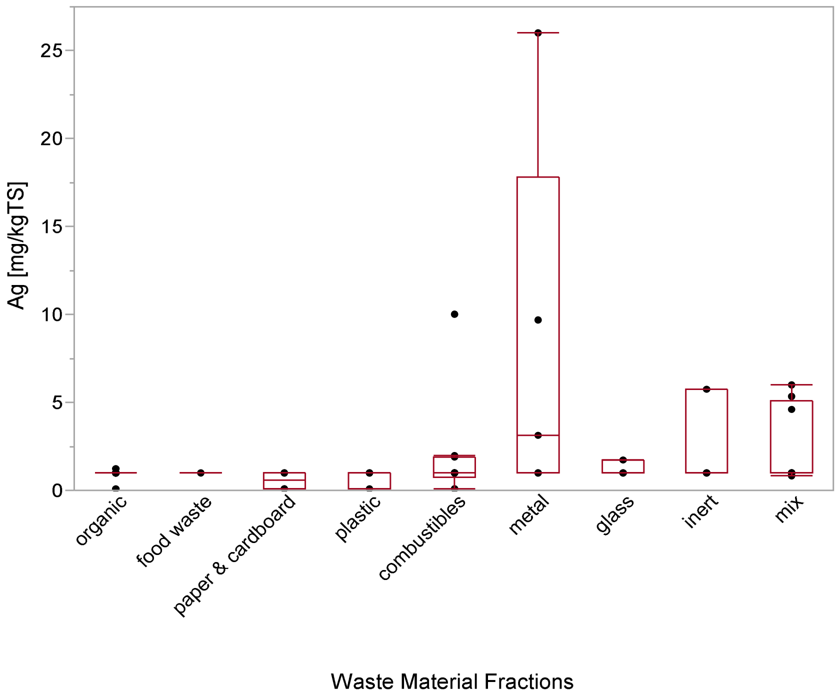
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	-	8	8	34	120	1175	2200	2200
food waste	1	-	45	45	45	45	45	45	45
gardening waste	12	-	200	230	413	788	1050	1502	1607
paper & cardboard	4	-	10	10	10	13	30	34	34
composites	-	-	-	-	-	-	-	-	-
plastic	3	-	821	821	821	4200	4433	4433	4433
combustibles	10	-	8	8	13	150	1450	2050	2067
metal	5	-	46	46	568	1100	2025	2150	2150
glass	3	-	230	230	230	250	289	289	289
inert	3	-	1533	1533	1533	2000	3730	3730	3730
mix	14	-	529	673	1101	1680	2425	2833	2990
Total	64	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Ag



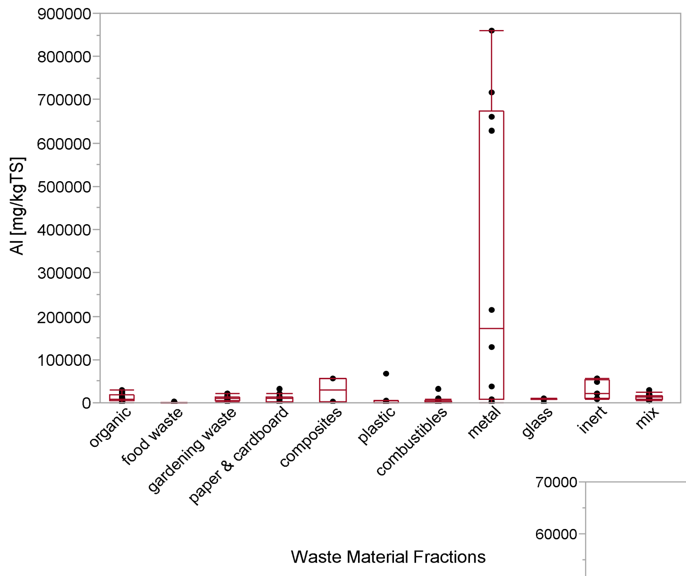
Quantiles [mg/kgTS]

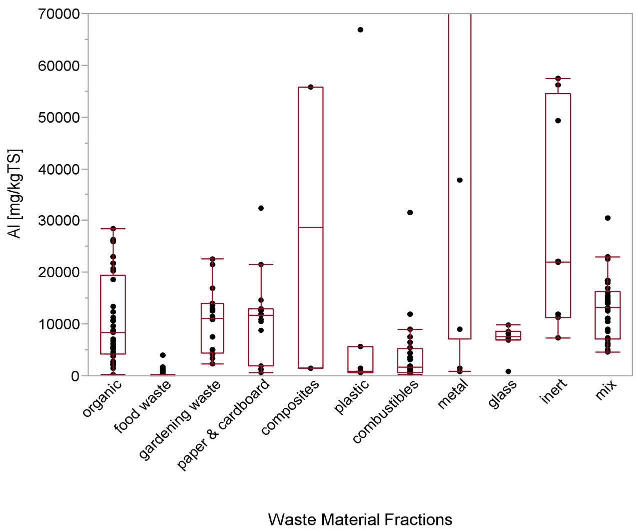
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	7	0.08	0.08	1.00	1.00	1.00	1.20	1.20
food waste	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	4	3	0.08	0.08	0.09	0.56	1.00	1.00	1.00
composites	-	-	-	-	-	-	-	-	-
plastic	3	3	0.08	0.08	0.08	1.00	1.00	1.00	1.00
combustibles	10	7	0.08	0.08	0.77	1.00	1.93	9.20	10.00
metal	5	4	1.00	1.00	1.00	3.14	17.85	26.00	26.00
glass	3	2	1.00	1.00	1.00	1.00	1.71	1.71	1.71
inert	3	2	1.00	1.00	1.00	1.00	5.78	5.78	5.78
mix	8	4	0.86	0.86	1.00	1.00	5.12	6.02	6.02
Total	46	33							

*) number of data points

**) number of values below the detection limit

Value ranges for Al



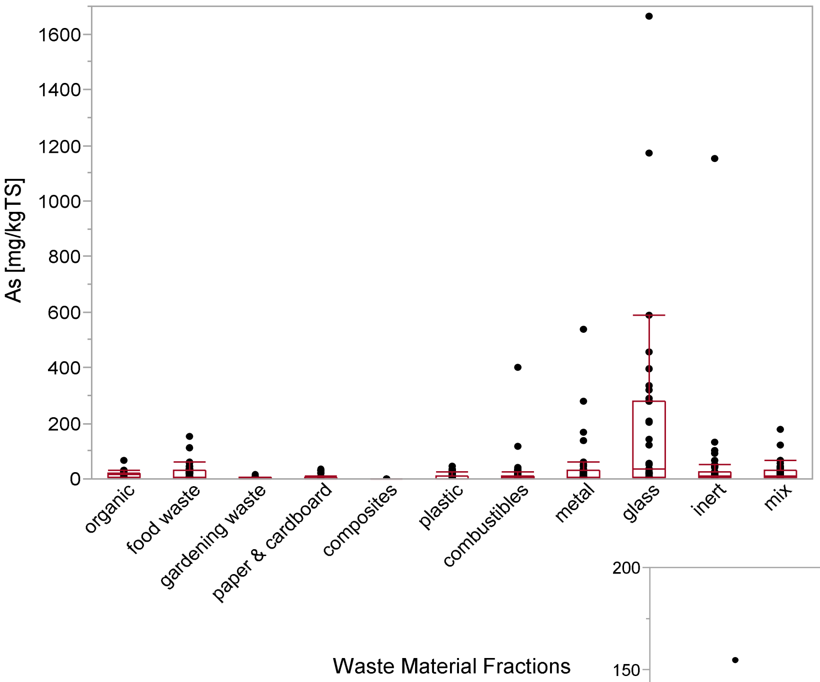


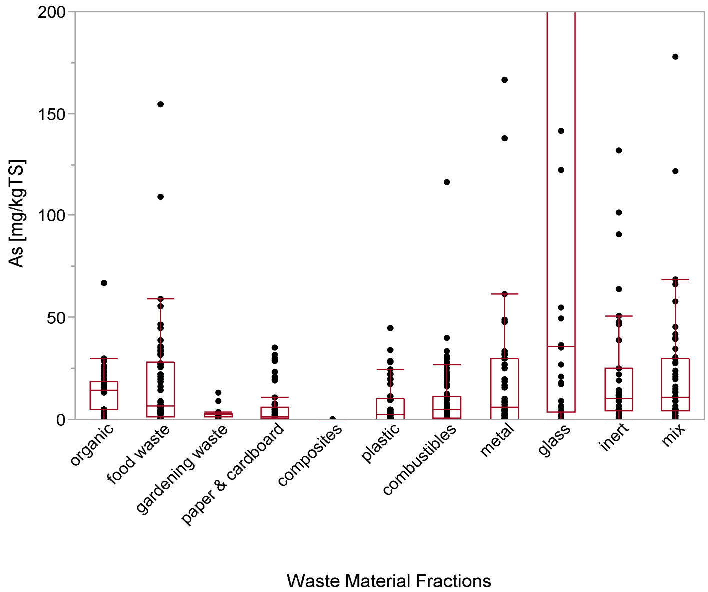
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	41	-	286	2160	4100	8400	19464	25412	28333
food waste	47	-	12	21	30	46	103	851	3890
gardening waste	16	-	2360	3088	4453	11178	13916	21859	22550
paper & cardboard	15	-	681	1033	1800	11700	12933	25870	32425
composites	2	-	1430	1430	1430	28615	55800	55800	55800
plastic	7	-	692	692	720	820	5650	66800	66800
combustibles	24	-	200	250	678	1570	5150	10500	31600
metal	10	-	860	926	7055	171500	674500	846700	861000
glass	7	-	750	750	6860	7620	8470	9870	9870
inert	8	-	7300	7300	11361	22000	54483	57500	57500
mix	34	-	4670	5435	7118	13080	16280	20478	30500
Grand Total	209	-							

*) number of data points
**) number of values below the detection limit

Value ranges for As





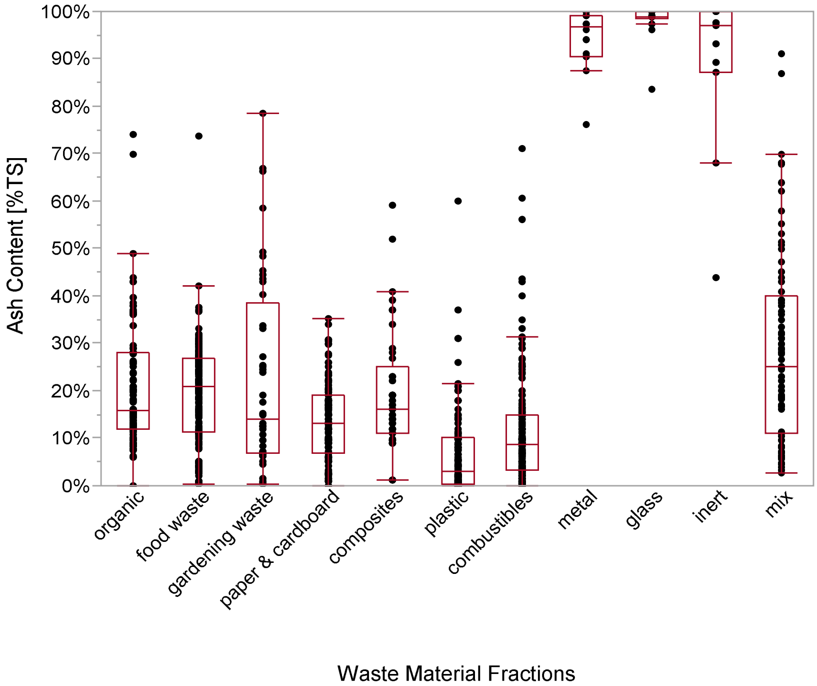
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	48	8	0.200	0.699	5.000	14.565	18.605	26.385	67.000
food waste	54	1	0.000	0.000	1.000	6.750	28.350	45.550	154.400
gardening waste	18	-	0.000	0.495	1.188	2.405	3.080	9.582	13.020
paper & cardboard	57	4	0.000	0.126	0.345	1.090	6.100	24.100	35.100
composites	3	-	0.140	0.140	0.140	0.200	0.200	0.200	0.200
plastic	46	5	0.000	0.000	0.215	2.250	10.075	25.580	44.800
combustibles	89	10	0.000	0.000	0.305	5.000	11.340	28.170	400.000
metal	45	1	0.000	0.000	0.000	6.200	29.800	92.040	539.000
glass	36	-	0.000	0.000	3.800	35.900	280.475	497.680	1664.400
inert	39	2	0.000	0.000	4.000	10.400	25.000	91.000	1153.000
mix	50	2	0.000	1.633	4.060	10.950	30.068	56.465	177.990
Grand Total	485	33							

*) number of data points

**) number of values below the detection limit

Value ranges for Ash Content



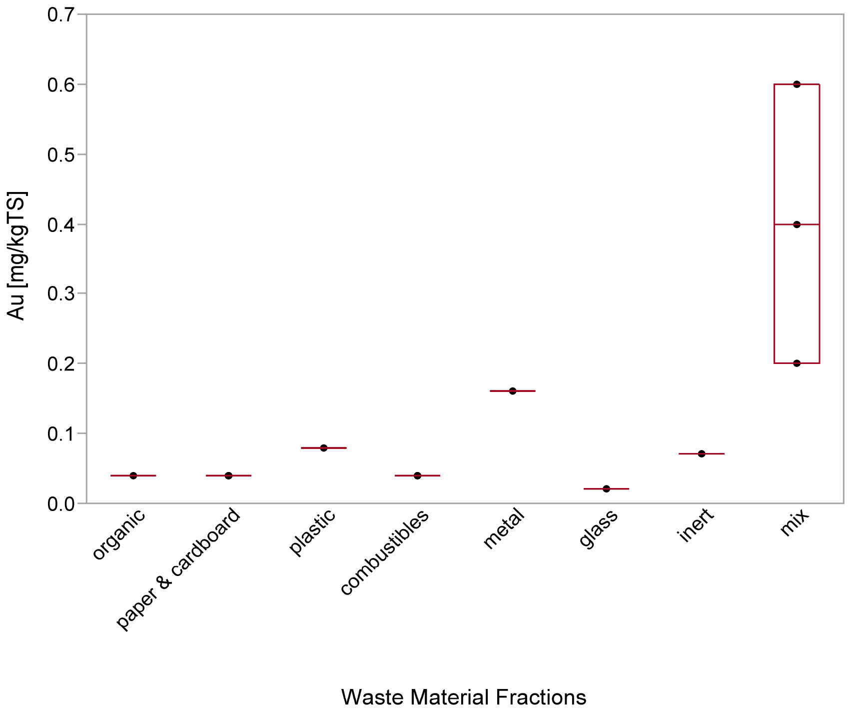
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	106	-	0.0%	8.5%	12.0%	15.7%	28.0%	38.0%	74.0%
food waste	196	-	0.2%	3.8%	11.5%	20.9%	26.9%	30.0%	73.7%
gardening waste	44	-	0.4%	3.0%	6.8%	14.0%	38.6%	53.9%	78.4%
paper & cardboard	112	-	0.0%	2.4%	6.8%	13.0%	19.0%	25.7%	35.4%
composites	41	-	1.2%	9.0%	11.0%	16.0%	25.0%	38.6%	59.0%
plastic	119	-	0.0%	0.1%	0.4%	3.0%	10.0%	18.0%	60.0%
combustibles	146	-	0.0%	1.0%	3.2%	8.7%	15.1%	26.6%	71.0%
metal	18	-	76.1%	86.5%	90.5%	96.7%	99.3%	100.0%	100.0%
glass	14	-	83.5%	89.8%	98.5%	98.9%	100.0%	100.0%	100.0%
inert	11	-	43.9%	48.7%	87.2%	97.0%	100.0%	100.0%	100.0%
mix	85	-	2.6%	6.1%	11.0%	25.0%	39.9%	62.8%	91.0%
Total	892	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Au



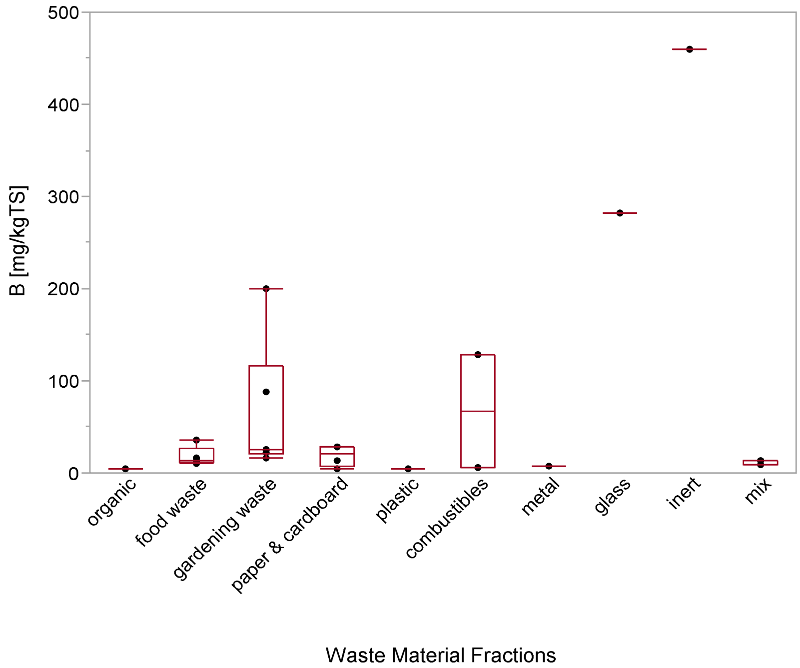
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	1	0.04	0.04	0.04	0.04	0.04	0.04	0.04
food waste	-	-	-	-	-	-	-	-	-
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	2	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04
composites	-	-	-	-	-	-	-	-	-
plastic	1	1	0.08	0.08	0.08	0.08	0.08	0.08	0.08
combustibles	2	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04
metal	1	-	0.16	0.16	0.16	0.16	0.16	0.16	0.16
glass	1	1	0.02	0.02	0.02	0.02	0.02	0.02	0.02
inert	1	-	0.07	0.07	0.07	0.07	0.07	0.07	0.07
mix	3	-	0.20	0.20	0.20	0.40	0.60	0.60	0.60
Grand Total	12	7							

*) number of data points

**) number of values below the detection limit

Value ranges for B



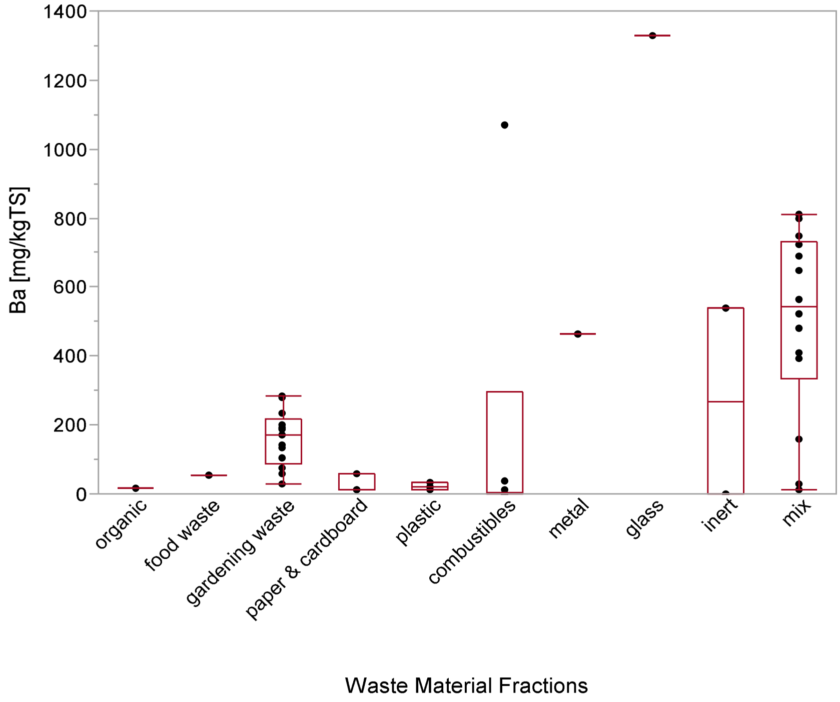
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	-	5.1	5.1	5.1	5.1	5.1	5.1	5.1
food waste	5	-	11.0	11.0	11.5	13.0	26.5	36.0	36.0
gardening waste	6	-	17.0	17.0	20.8	25.5	116.0	200.0	200.0
paper & cardboard	4	-	4.6	4.6	6.9	21.0	28.5	28.7	28.7
composites	-	-	-	-	-	-	-	-	-
plastic	1	-	4.1	4.1	4.1	4.1	4.1	4.1	4.1
combustibles	2	-	5.6	5.6	5.6	66.8	128.0	128.0	128.0
metal	1	-	7.4	7.4	7.4	7.4	7.4	7.4	7.4
glass	1	-	282.0	282.0	282.0	282.0	282.0	282.0	282.0
inert	1	-	459.0	459.0	459.0	459.0	459.0	459.0	459.0
mix	3	-	8.6	8.6	8.6	14.0	14.0	14.0	14.0
Grand Total	25	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Ba



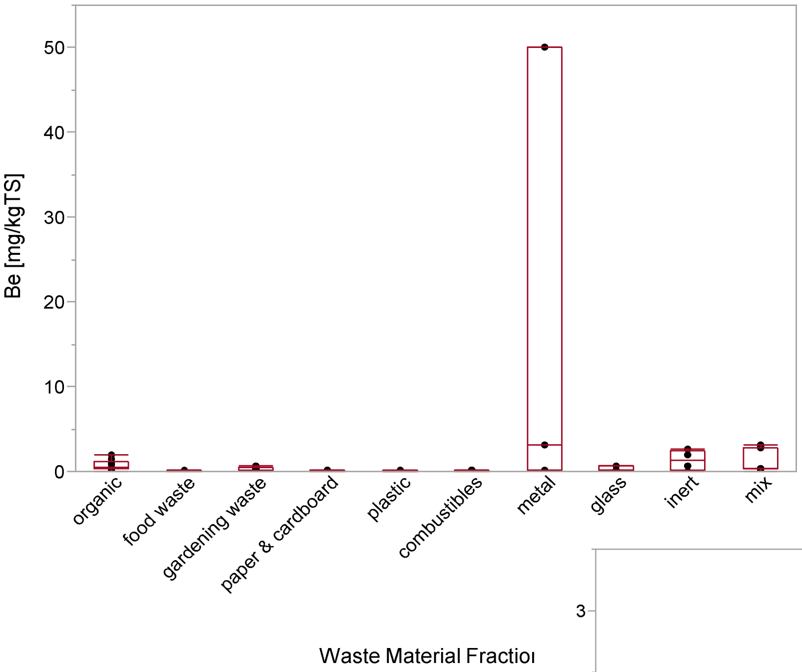
Quantiles [mg/kgTS]

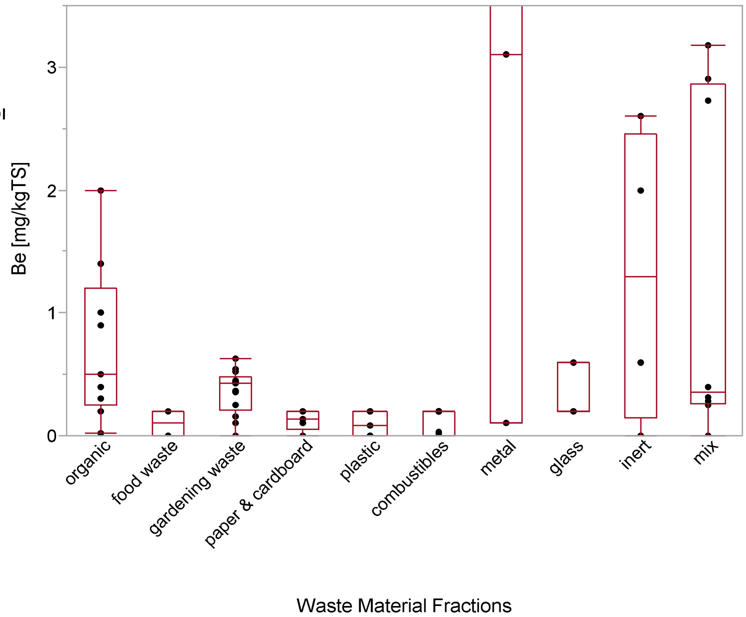
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	-	18.1	18.1	18.1	18.1	18.1	18.1	18.1
food waste	1	-	55.1	55.1	55.1	55.1	55.1	55.1	55.1
gardening waste	13	-	27.8	39.5	89.1	170.2	216.1	282.7	283.3
paper & cardboard	3	-	12.3	12.3	12.3	12.5	60.1	60.1	60.1
composites	-	-	-	-	-	-	-	-	-
plastic	3	-	12.8	12.8	12.8	22.5	33.4	33.4	33.4
combustibles	6	-	0.0	0.0	0.0	5.3	297.5	1071.0	1071.0
metal	1	-	464.0	464.0	464.0	464.0	464.0	464.0	464.0
glass	1	-	1330.0	1330.0	1330.0	1330.0	1330.0	1330.0	1330.0
inert	2	-	0.0	0.0	0.0	269.5	539.0	539.0	539.0
mix	14	-	13.6	21.0	335.8	543.5	730.0	804.5	809.0
Grand Total	45	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Be





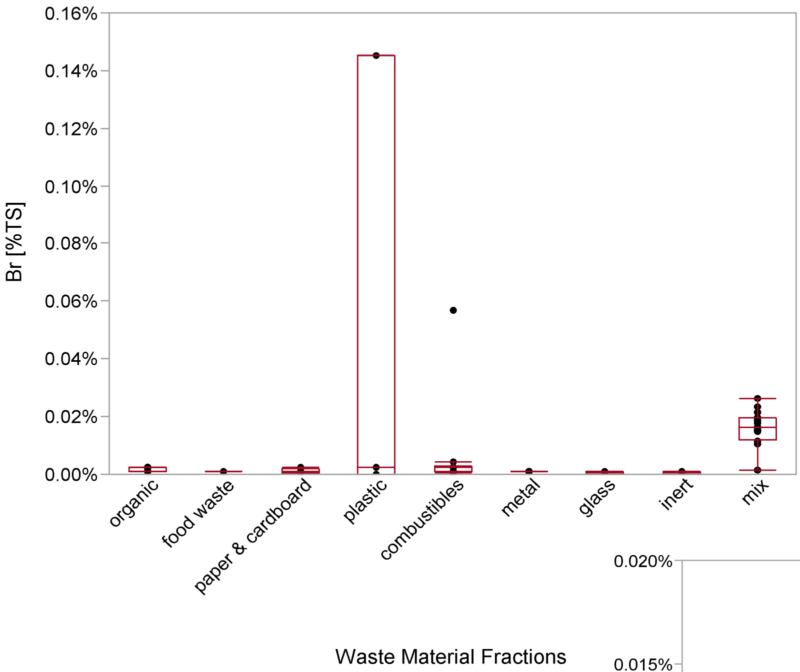
Quantiles [mg/kgTS]

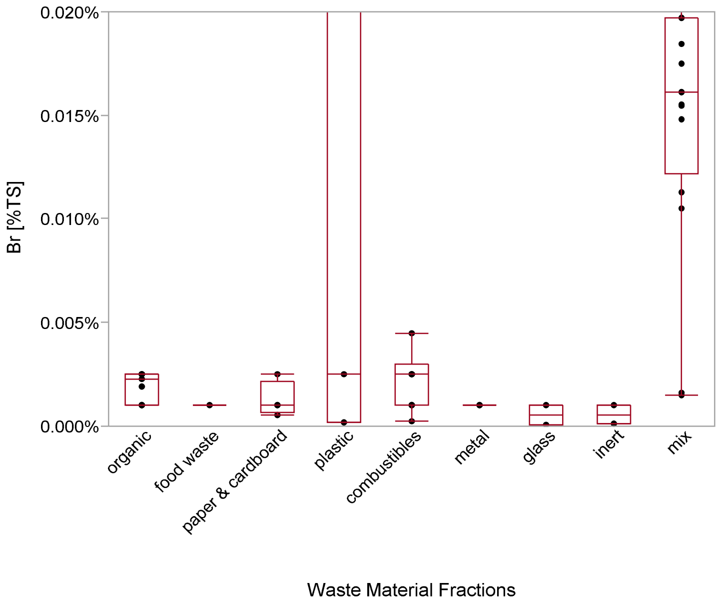
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	1	0.02	0.02	0.25	0.50	1.20	2.00	2.00
food waste	2	-	0.00	0.00	0.00	0.10	0.20	0.20	0.20
gardening waste	13	-	0.00	0.04	0.21	0.43	0.49	0.59	0.63
paper & cardboard	5	-	0.00	0.00	0.05	0.14	0.20	0.20	0.20
composites	-	-	-	-	-	-	-	-	-
plastic	5	1	0.00	0.00	0.00	0.08	0.20	0.20	0.20
combustibles	14		0.00	0.00	0.00	0.20	0.20	0.20	0.20
metal	3	1	0.10	0.10	0.10	3.10	50.00	50.00	50.00
glass	3	-	0.20	0.20	0.20	0.20	0.60	0.60	0.60
inert	4	-	0.00	0.00	0.15	1.30	2.45	2.60	2.60
mix	8	-	0.00	0.00	0.26	0.36	2.86	3.18	3.18
Grand Total	66	3							

*) number of data points

**) number of values below the detection limit

Value ranges for Br





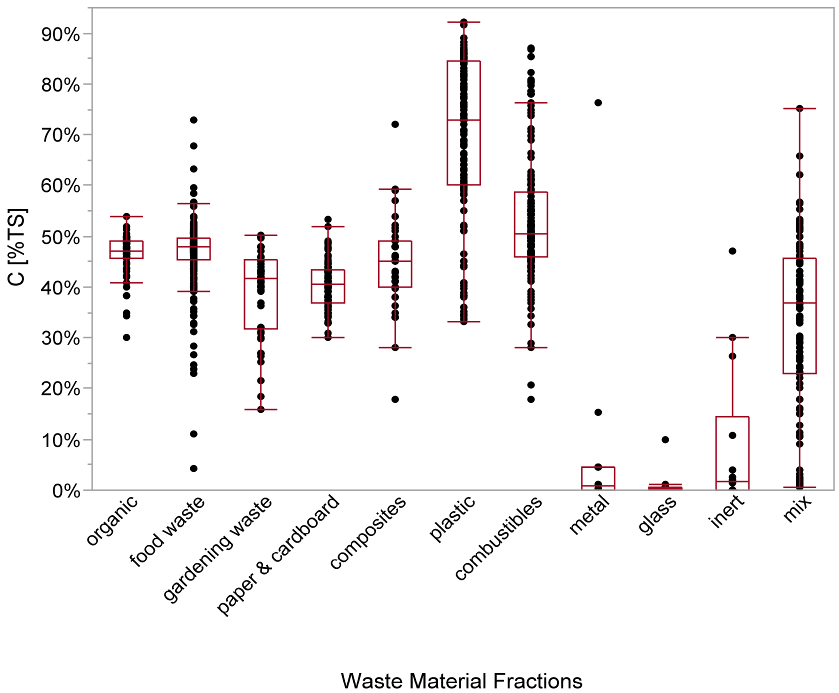
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	7	0.001%	0.001%	0.001%	0.002%	0.003%	0.003%	0.003%
food waste	1	1	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	4	2	0.001%	0.001%	0.001%	0.001%	0.002%	0.003%	0.003%
composites	-	-	-	-	-	-	-	-	-
plastic	3	1	0.000%	0.000%	0.000%	0.003%	0.145%	0.145%	0.145%
combustibles	10	7	0.000%	0.000%	0.001%	0.003%	0.003%	0.052%	0.057%
metal	2	2	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
glass	2	2	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%
inert	2	1	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%
mix	16	1	0.002%	0.002%	0.012%	0.016%	0.020%	0.024%	0.026%
Total	49	24							

*) number of data points

**) number of values below the detection limit

Value ranges for C



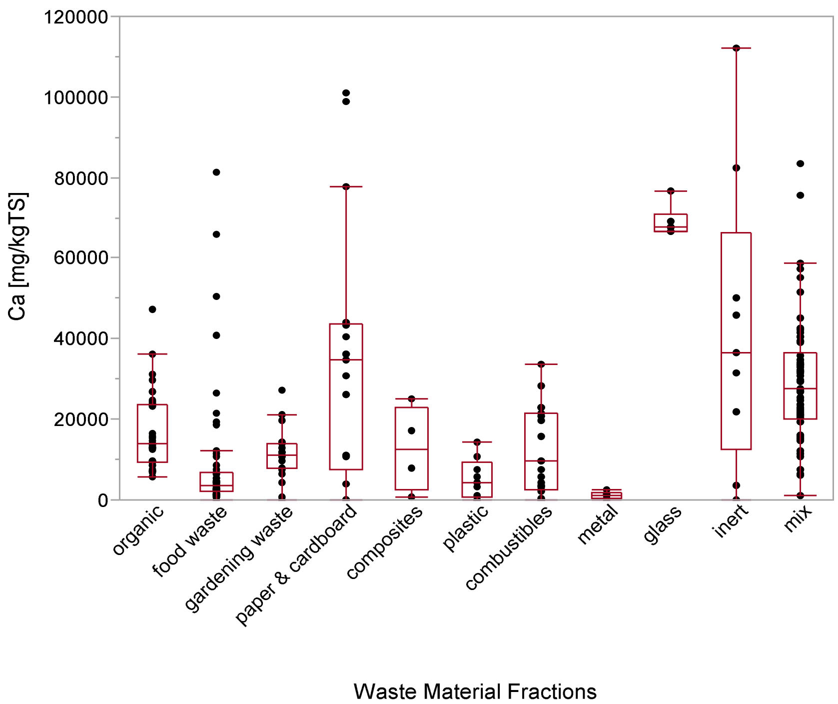
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	61	-	30.0%	40.2%	45.6%	47.2%	49.0%	50.0%	54.0%
food waste	211	-	4.4%	39.5%	45.2%	47.9%	49.8%	51.6%	73.0%
gardening waste	49	-	15.8%	26.5%	31.7%	41.8%	45.5%	47.8%	50.1%
paper & cardboard	113	-	30.2%	34.4%	37.0%	40.5%	43.3%	46.2%	53.4%
composites	42	-	18.0%	34.0%	39.9%	45.0%	49.0%	56.1%	72.0%
plastic	137	-	33.3%	40.7%	60.0%	73.0%	84.5%	86.1%	92.1%
combustibles	152	-	18.0%	42.6%	46.1%	50.5%	58.6%	76.2%	87.1%
metal	14	-	0.0%	0.0%	0.0%	0.8%	4.5%	45.7%	76.2%
glass	14	-	0.0%	0.0%	0.0%	0.4%	0.5%	5.5%	9.8%
inert	14	-	0.0%	0.0%	0.0%	1.6%	14.6%	38.6%	47.1%
mix	104	-	0.6%	3.5%	23.0%	36.8%	45.8%	52.2%	75.2%
Grand Total	911	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Ca



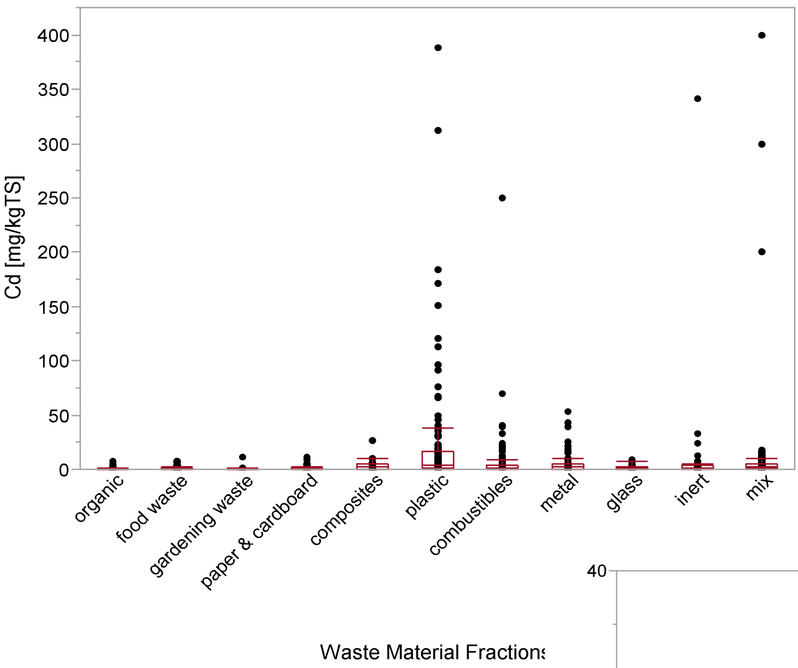
Quantiles [mg/kgTS]

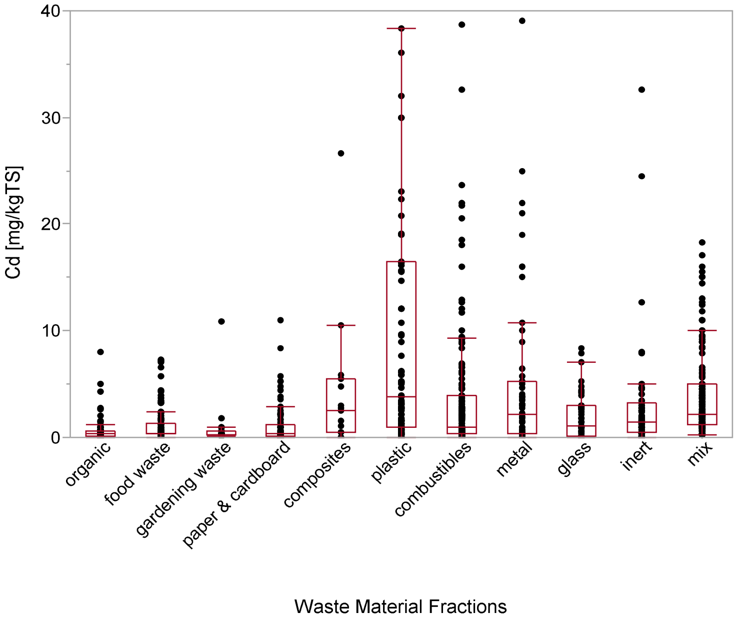
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	38	-	5700	7180	9475	14000	23750	29850	47313
food waste	57	-	0	1156	1977	3611	6709	22553	81250
gardening waste	21	-	0	1306	7750	11256	14149	20838	27100
paper & cardboard	17	-	0	0	7415	34600	43600	99160	101000
composites	4	-	727	727	2500	12555	23080	25010	25010
plastic	9	-	21.5	22	577	4160	9270	14260	14260
combustibles	23	-	45.7	51	2390	9510	21522	26140	33770
metal	6	-	36	36	192	1143	1728	2410	2410
glass	6	-	66730	66730	66783	67775	70900	76600	76600
inert	9	-	0	0	12675	36400	66303	112110	112110
mix	62	-	1228.6	10950	20075	27500	36675	49640	83550
Grand Total	252	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Cd





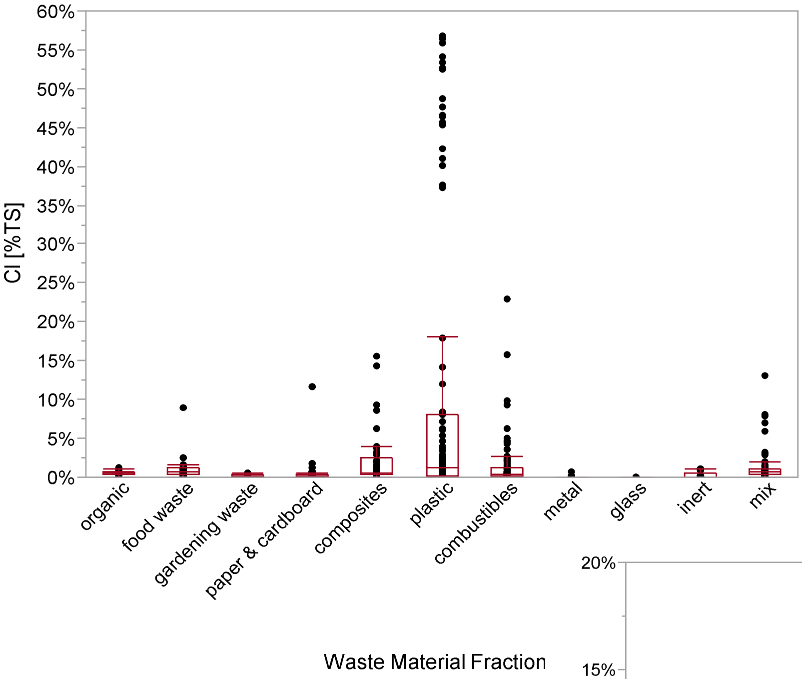
Quantiles [mg/kgTS]

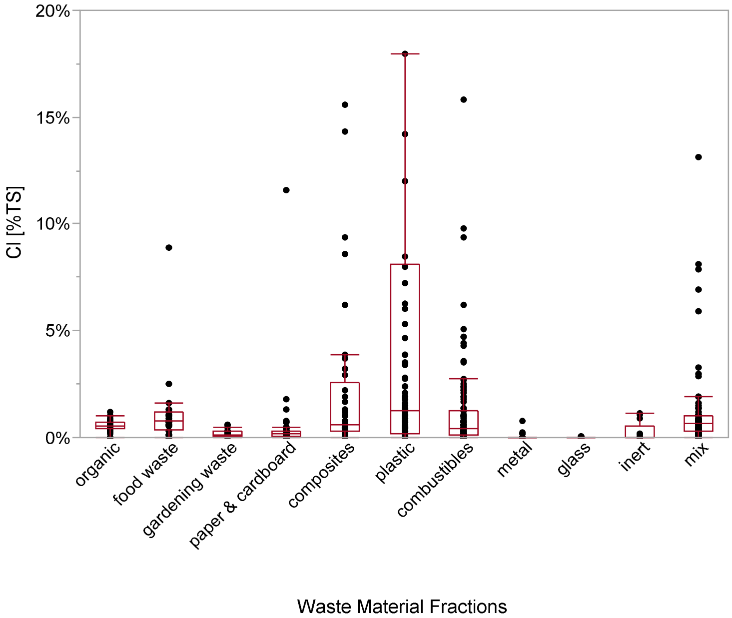
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	71	5	0.00	0.08	0.15	0.35	0.60	1.56	7.95
food waste	100	42	0.00	0.10	0.40	0.40	1.28	3.49	7.30
gardening waste	23	-	0.11	0.16	0.20	0.25	0.60	1.48	10.85
paper & cardboard	88	4	0.00	0.00	0.09	0.30	1.25	3.62	11.00
composites	15	-	0.00	0.01	0.50	2.52	5.50	16.94	26.60
plastic	103	2	0.00	0.20	0.90	3.80	16.50	72.68	388.00
combustibles	158	3	0.00	0.00	0.30	1.00	3.93	11.73	250.00
metal	71	5	0.00	0.00	0.30	2.10	5.20	18.40	53.00
glass	49	4	0.00	0.00	0.15	1.10	2.95	4.80	8.40
inert	50	-	0.00	0.00	0.50	1.45	3.28	7.99	341.00
mix	141	-	0.20	0.76	1.25	2.17	5.04	11.67	400.00
Grand Total	869	65							

*) number of data points

**) number of values below the detection limit

Value ranges for Cl





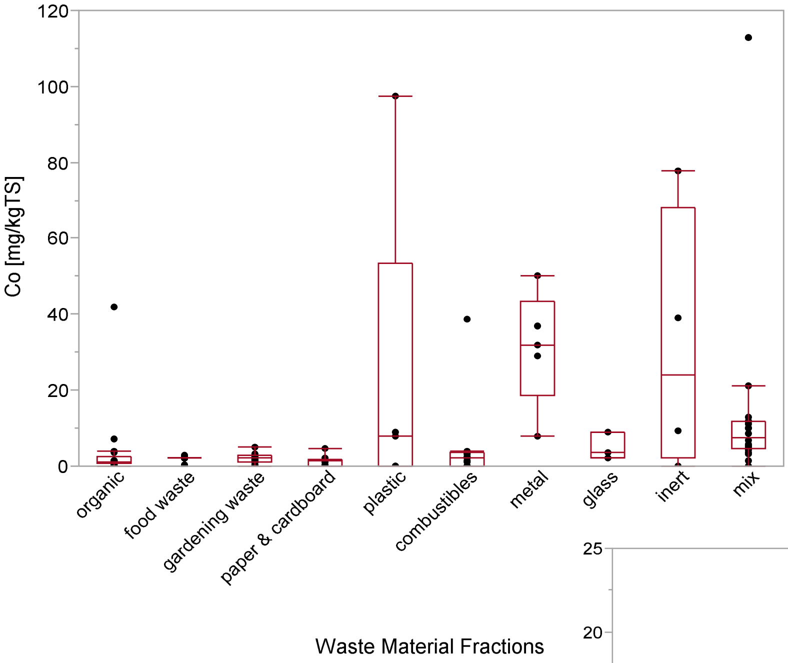
Quantiles [%TS]

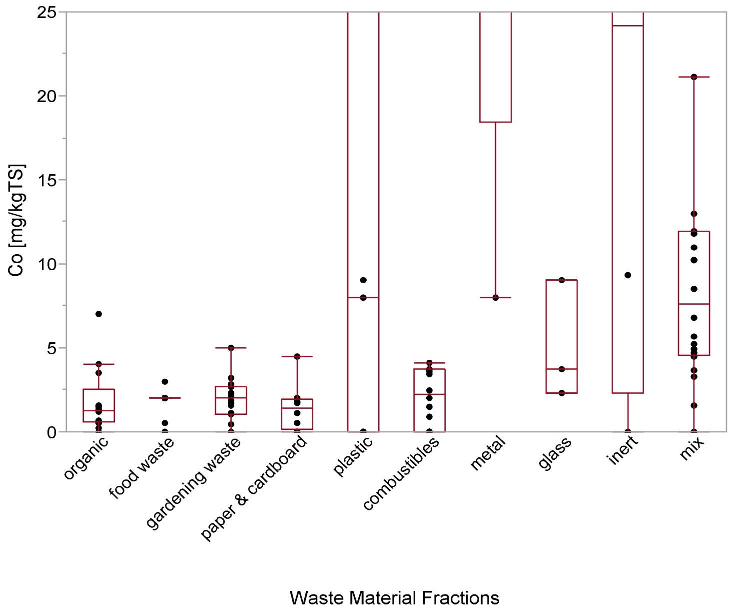
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	58	-	0.001%	0.165%	0.400%	0.532%	0.700%	0.806%	1.200%
food waste	20	-	0.000%	0.012%	0.365%	0.765%	1.173%	2.413%	8.900%
gardening waste	26	-	0.000%	0.047%	0.078%	0.110%	0.283%	0.530%	0.600%
paper & cardboard	75	-	0.000%	0.001%	0.070%	0.160%	0.300%	0.500%	11.600%
composites	41	-	0.000%	0.000%	0.300%	0.600%	2.550%	8.120%	15.600%
plastic	90	-	0.000%	0.000%	0.200%	1.250%	8.125%	47.605%	56.800%
combustibles	114	-	0.000%	0.000%	0.100%	0.400%	1.248%	3.550%	23.000%
metal	19	-	0.000%	0.000%	0.000%	0.000%	0.001%	0.240%	0.760%
glass	10	-	0.000%	0.000%	0.000%	0.000%	0.000%	0.054%	0.060%
inert	13	-	0.000%	0.000%	0.000%	0.020%	0.550%	1.094%	1.110%
mix	81	-	0.000%	0.104%	0.305%	0.670%	1.000%	2.692%	13.160%
Total	547	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Co





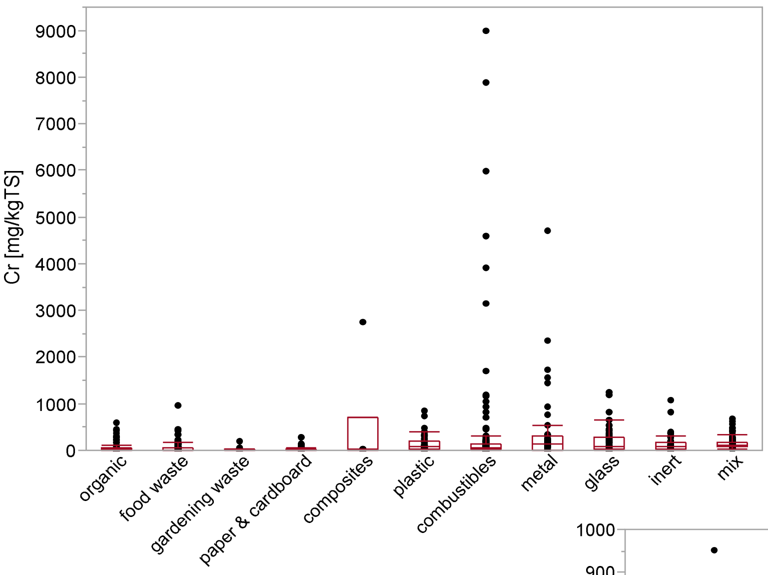
Quantiles [mg/kgTS]

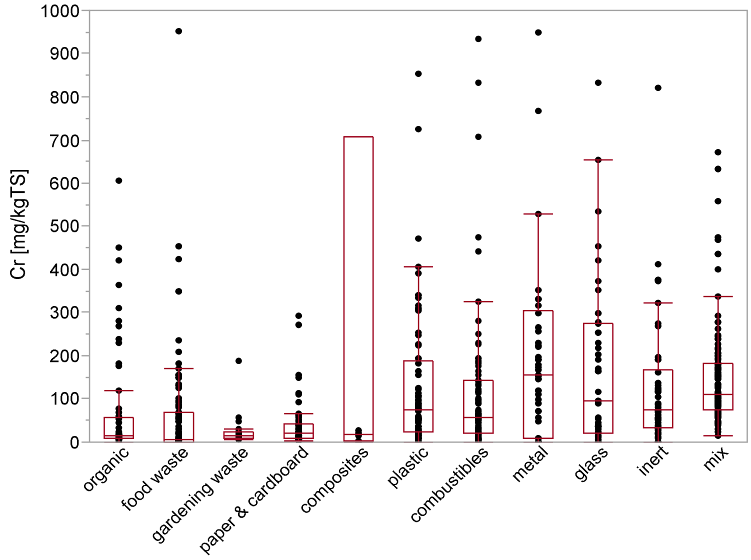
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	17	1	0.0	0.2	0.6	1.3	2.6	14.0	42.0
food waste	43	41	0.0	2.0	2.0	2.0	2.0	2.0	3.0
gardening waste	14	-	0.0	0.2	1.1	2.0	2.7	4.1	5.0
paper & cardboard	8	1	0.0	0.0	0.1	1.4	2.0	4.5	4.5
composites	-	-	-	-	-	-	-	-	-
plastic	5	-	0.0	0.0	0.0	8.0	53.3	97.6	97.6
combustibles	14	-	0.0	0.0	0.0	2.3	3.7	21.4	38.7
metal	5	-	8.0	8.0	18.5	32.0	43.5	50.0	50.0
glass	3	-	2.3	2.3	2.3	3.7	9.0	9.0	9.0
inert	4	-	0.0	0.0	2.3	24.2	68.0	77.7	77.7
mix	20	-	0.0	1.8	4.5	7.6	11.9	103.8	113.0
Grand Total	133	43							

*) number of data points

**) number of values below the detection limit

Value ranges for Cr



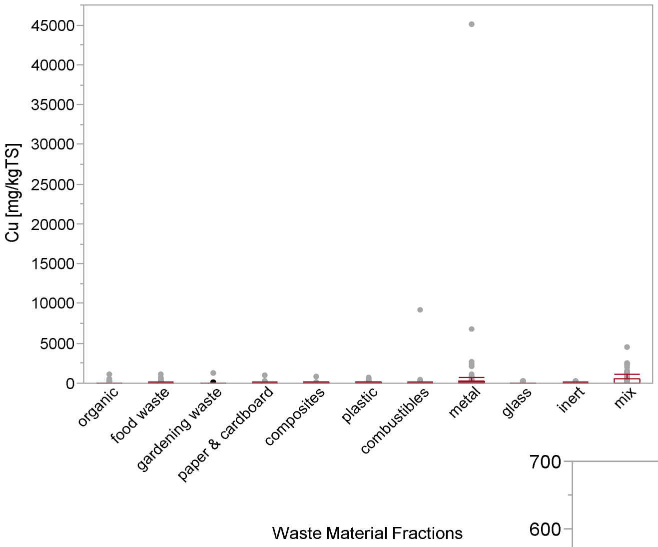


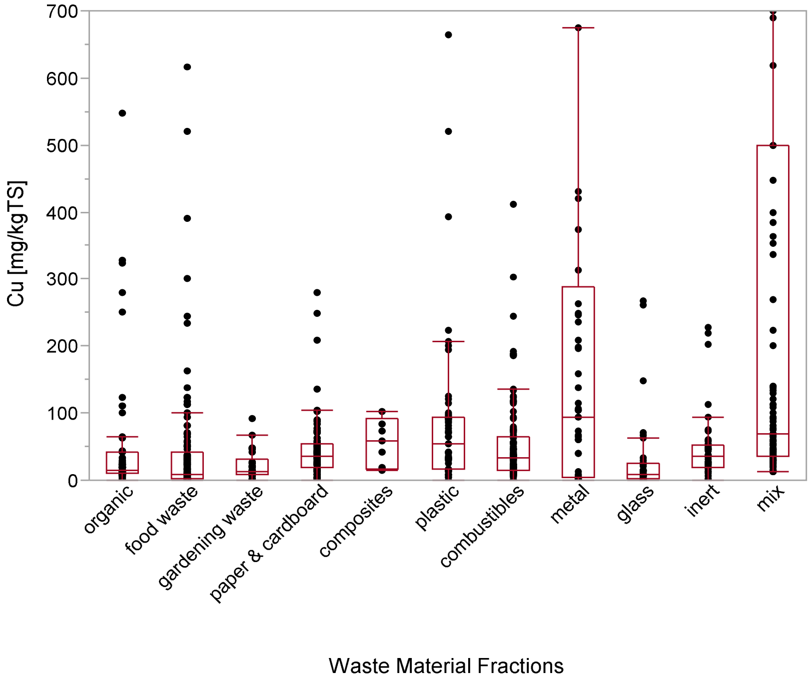
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	62	-	1.3	6.2	8.4	14.8	56.3	277.0	607.0
food waste	103	17	0.0	1.0	1.1	5.2	69.0	155.3	951.5
gardening waste	19	1	4.5	8.0	8.7	16.2	23.0	55.5	188.7
paper & cardboard	65	-	2.5	5.4	8.8	20.0	40.3	99.4	291.8
composites	6	-	1.0	1.0	2.4	18.5	708.5	2750.0	2750.0
plastic	73	-	0.4	9.7	25.4	73.9	187.0	338.4	853.0
combustibles	122	-	0.0	6.2	19.8	56.4	142.2	795.3	9000.0
metal	50	-	0.0	0.0	9.2	154.5	304.3	1387.0	4702.0
glass	49	-	0.0	0.0	21.6	95.3	275.7	534.0	1236.8
inert	50	-	0.0	13.4	34.0	74.3	167.5	377.1	1075.5
mix	116	-	16.0	53.0	74.8	111.8	182.3	277.1	671.1
Grand Total	715	18							

*) number of data points
**) number of values below the detection limit

Value ranges for Cu





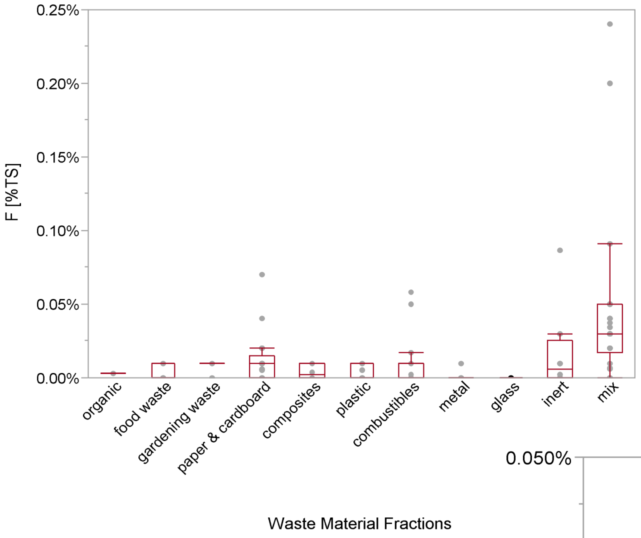
Quantiles [mg/kgTS]

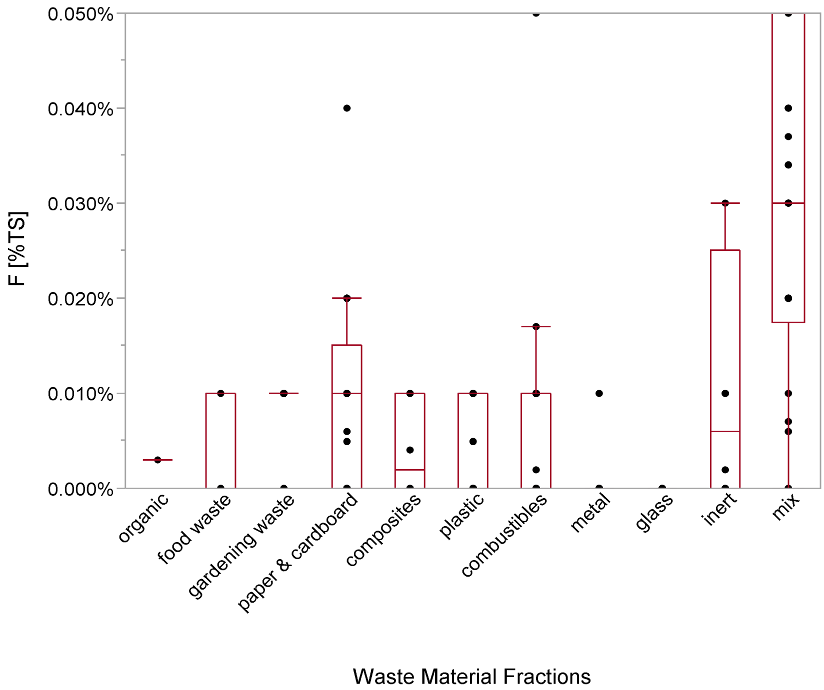
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	59	-	0.00	7.22	10.20	15.10	41.45	250.00	1196.59
food waste	117	40	0.00	2.00	2.00	9.00	42.00	126.82	1168.20
gardening waste	30	-	0.18	0.60	7.93	13.11	31.25	64.30	1238.61
paper & cardboard	72	-	0.00	7.86	17.78	34.76	55.20	98.49	1019.60
composites	9	-	14.00	14.00	17.05	59.40	92.55	834.00	834.00
plastic	57	-	0.00	8.24	16.85	54.20	93.85	201.20	665.30
combustibles	112	-	0.00	8.79	14.35	33.60	65.35	131.93	9240.00
metal	53	1	0.00	0.00	4.55	94.50	288.60	1691.20	45100.00
glass	42	-	0.00	0.00	1.85	8.50	26.00	69.64	267.50
inert	46	-	0.00	0.56	18.58	35.80	51.70	99.70	227.00
mix	110	-	12.17	19.61	35.21	67.93	500.00	1154.99	4500.00
Grand Total	707	41							

*) number of data points

**) number of values below the detection limit

Value ranges for F



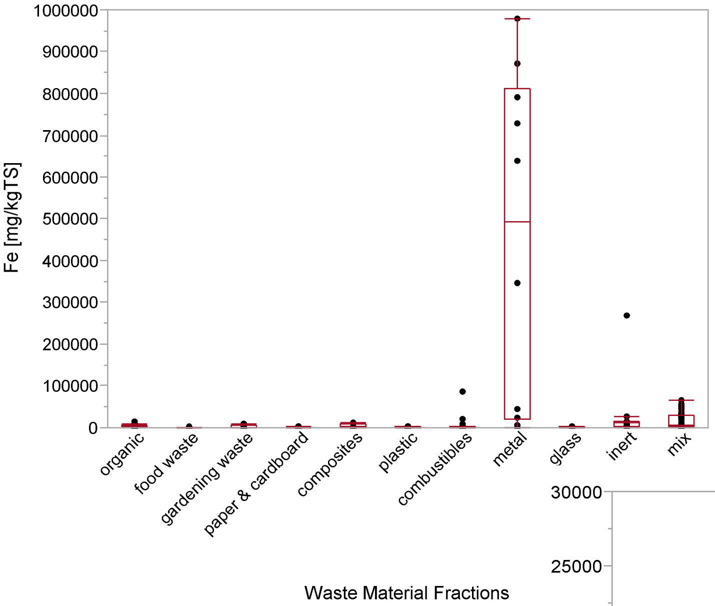


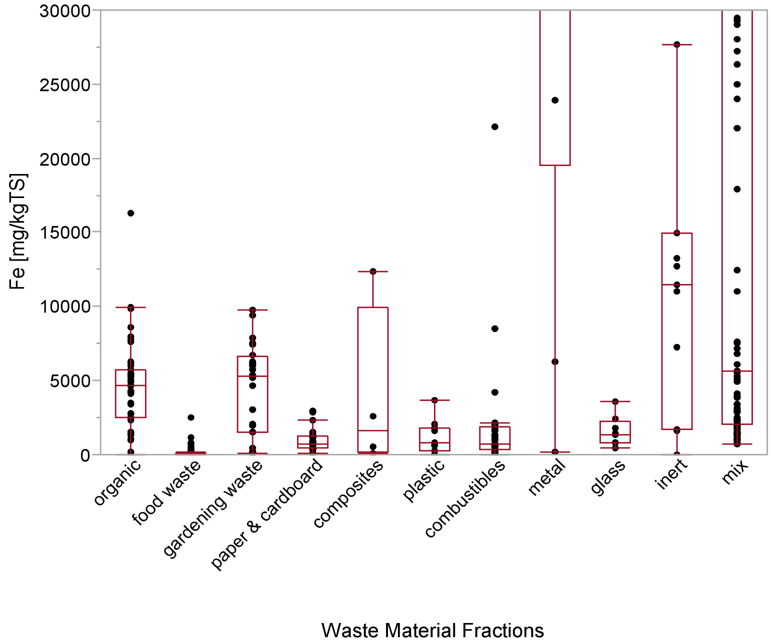
Quantiles [%TS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	-	-	-	-	-	-	-	-	-
food waste	5	-	0.000%	0.000%	0.000%	0.000%	0.010%	0.010%	0.010%
gardening waste	16	12	0.000%	0.000%	0.010%	0.010%	0.010%	0.010%	0.010%
paper & cardboard	21	-	0.000%	0.000%	0.000%	0.010%	0.015%	0.036%	0.070%
composites	6	-	0.000%	0.000%	0.000%	0.002%	0.010%	0.010%	0.010%
plastic	14	-	0.000%	0.000%	0.000%	0.000%	0.010%	0.010%	0.010%
combustibles	25	-	0.000%	0.000%	0.000%	0.010%	0.010%	0.030%	0.058%
metal	17	-	0.000%	0.000%	0.000%	0.000%	0.000%	0.002%	0.010%
glass	6	-	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
inert	8	-	0.000%	0.000%	0.000%	0.006%	0.025%	0.087%	0.087%
mix	22	-	0.000%	0.002%	0.018%	0.030%	0.050%	0.200%	0.240%
Total	140	12							

*) number of data points
**) number of values below the detection limit

Value ranges for Fe





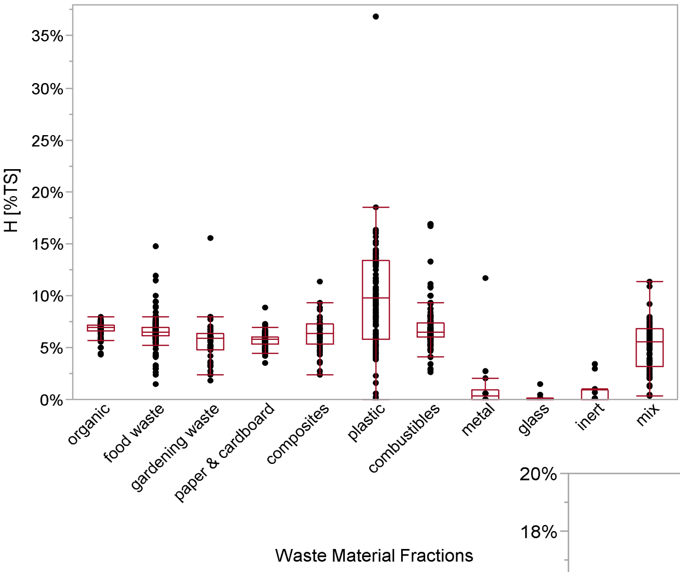
Quantiles [mg/kgTS]

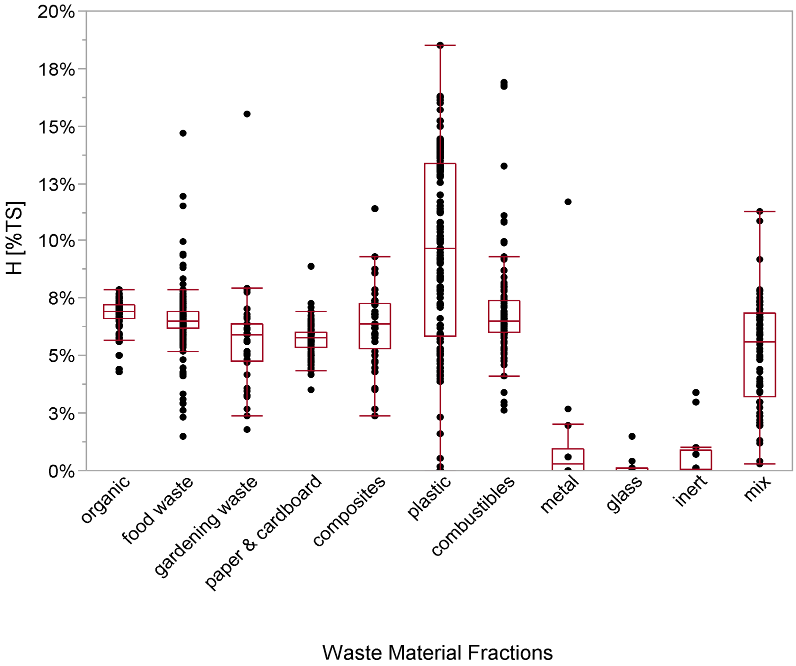
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	45	-	0	1220	2500	4700	5700	8240	16333
food waste	64	-	0	18	29	48	88	409	2478
gardening waste	24	-	76	168	1485	5270	6600	8643	9728
paper & cardboard	22	-	46	147	459	755	1245	2722	2940
composites	4	-	86	86	199	1585	9898	12320	12320
plastic	11	-	0	0	305	849	1830	3380	3700
combustibles	31	-	0	9	340	733	1850	7634	85100
metal	10	-	150	765	19500	492500	810750	969300	980000
glass	8	-	477	477	777	1350	2240	3567	3567
inert	11	-	0	320	1730	11500	14990	219940	268000
mix	82	-	684	1299	2017	5605	30819	49137	66000
Total	312	0							

*) number of data points

**) number of values below the detection limit

Value ranges for H





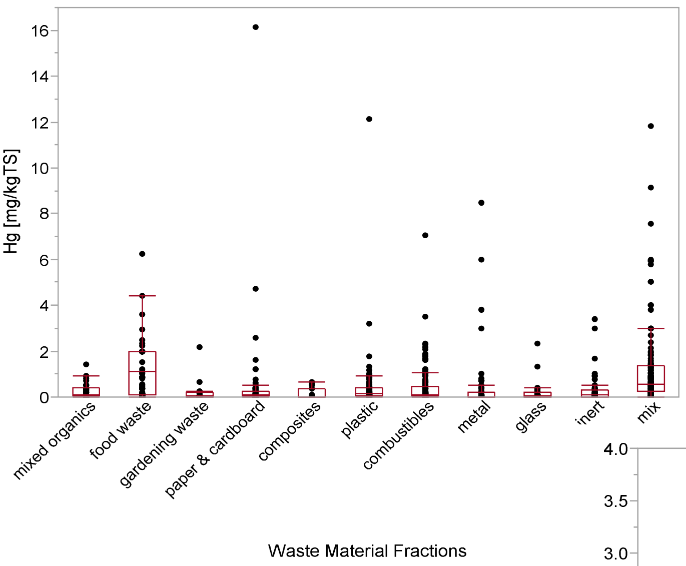
Quantiles [%TS]

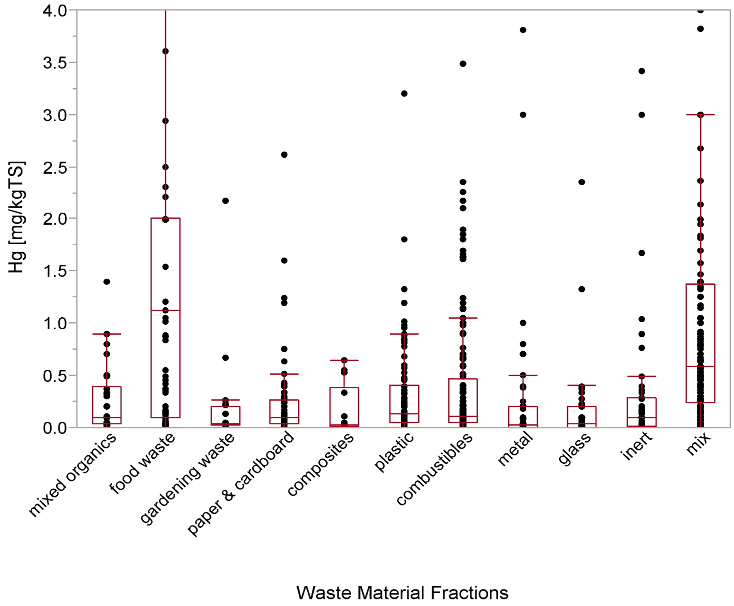
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	59	-	4.3%	5.7%	6.6%	6.9%	7.2%	7.5%	7.9%
food waste	173	-	1.5%	5.5%	6.2%	6.5%	6.9%	7.6%	14.7%
gardening waste	40	-	1.8%	3.2%	4.8%	5.9%	6.4%	7.7%	15.5%
paper & cardboard	112	-	3.5%	4.8%	5.4%	5.8%	6.0%	6.4%	8.9%
composites	40	-	2.4%	3.7%	5.3%	6.4%	7.3%	8.5%	11.4%
plastic	151	-	0.0%	3.9%	5.8%	9.7%	13.4%	14.4%	36.9%
combustibles	138	-	2.6%	5.3%	6.0%	6.5%	7.4%	9.3%	16.9%
metal	14	-	0.0%	0.0%	0.0%	0.3%	1.0%	7.2%	11.7%
glass	13	1	0.0%	0.0%	0.0%	0.0%	0.1%	1.1%	1.5%
inert	12	-	0.0%	0.0%	0.0%	0.1%	0.9%	3.3%	3.4%
mix	73	-	0.3%	2.0%	3.2%	5.6%	6.8%	7.5%	11.3%
Grand Total	825	1							

*) number of data points

**) number of values below the detection limit

Value ranges for Hg



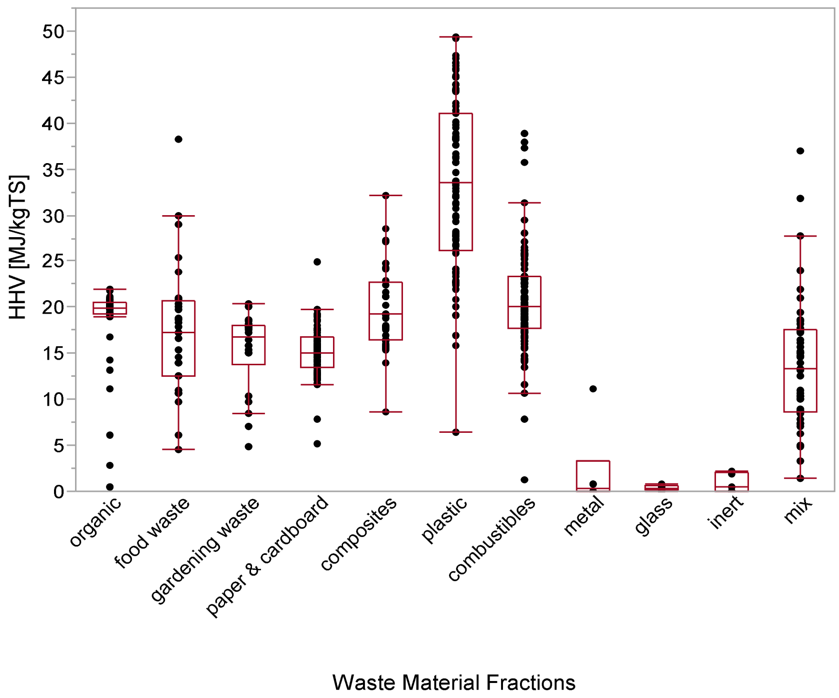


Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	34	4	0.000	0.020	0.040	0.100	0.396	0.850	1.400
food waste	99	41	0.000	0.020	0.100	1.120	2.000	2.000	6.250
*food waste -alt****	*59*	*1*	*0.000*	*0.000*	*0.040*	*0.140*	*0.870*	*2.310*	*6.250*
gardening waste	20	3	0.000	0.020	0.023	0.040	0.198	0.629	2.170
paper & cardboard	84	6	0.000	0.000	0.030	0.098	0.265	0.570	16.160
composites	14	-	0.000	0.000	0.008	0.025	0.380	0.595	0.640
plastic	89	3	0.000	0.000	0.045	0.130	0.400	0.891	12.150
combustibles	140	6	0.000	0.000	0.050	0.110	0.470	1.573	7.030
metal	60	5	0.000	0.000	0.000	0.025	0.200	0.790	8.500
glass	49	6	0.000	0.000	0.000	0.040	0.200	0.340	2.350
inert	49	5	0.000	0.000	0.015	0.100	0.285	0.900	3.420
mix	113	-	0.000	0.070	0.235	0.580	1.375	3.928	11.800
Grand Total	751	79							

*) number of data points
**) number of values below the detection limit
***) alternativ calculation excluding 55 data points from Wrap 2010, which were all below the same detection limit

Value ranges for HHV



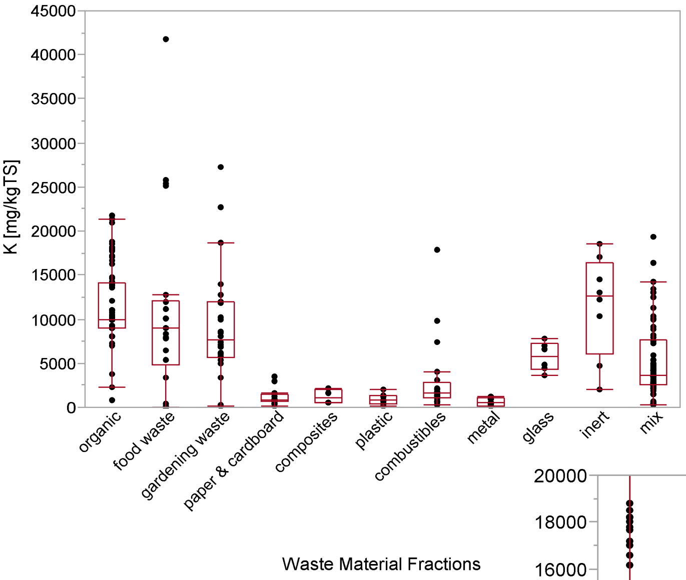
Quantiles [MJ/kgTS]

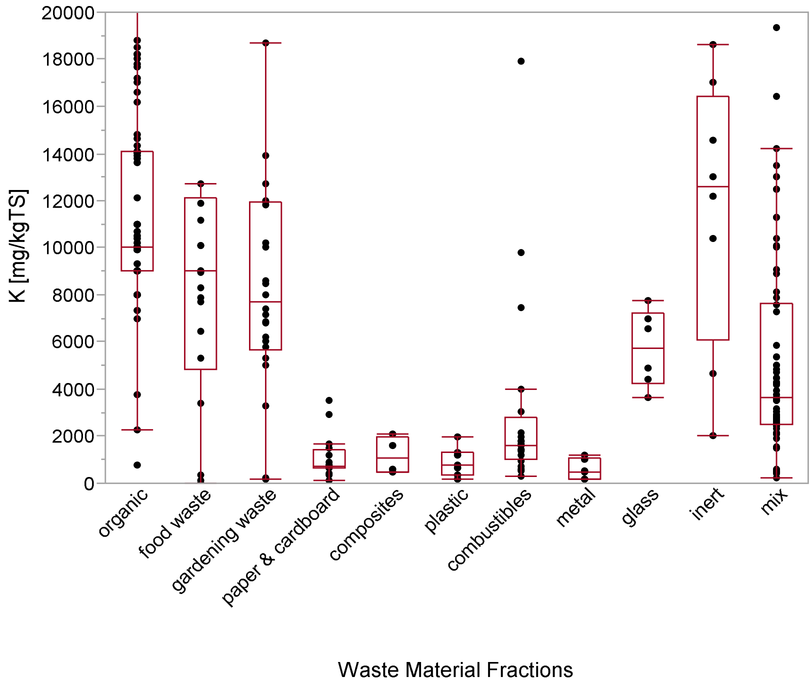
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	55	2	0.5	12.4	19.2	20.0	20.6	21.0	22.0
food waste	29	-	4.6	9.6	12.5	17.3	20.6	29.0	38.3
gardening waste	22	-	4.8	7.4	13.9	16.8	18.0	19.6	20.4
paper & cardboard	79	-	5.2	12.4	13.6	15.1	16.7	18.5	24.9
composites	36	-	8.6	15.4	16.4	19.2	22.8	27.2	32.2
plastic	91	-	6.5	22.4	26.1	33.5	41.0	45.7	49.4
combustibles	100	-	1.3	15.5	17.7	20.0	23.3	26.2	38.9
metal	6	-	0.0	0.0	0.0	0.4	3.3	11.1	11.1
glass	6	2	0.0	0.0	0.1	0.4	0.6	0.8	0.8
inert	5	1	0.0	0.0	0.0	0.5	2.0	2.2	2.2
mix	45	-	1.4	5.8	8.6	13.4	17.5	22.8	37.0
Total	474	5							

*) number of data points

**) number of values below the detection limit

Value ranges for K





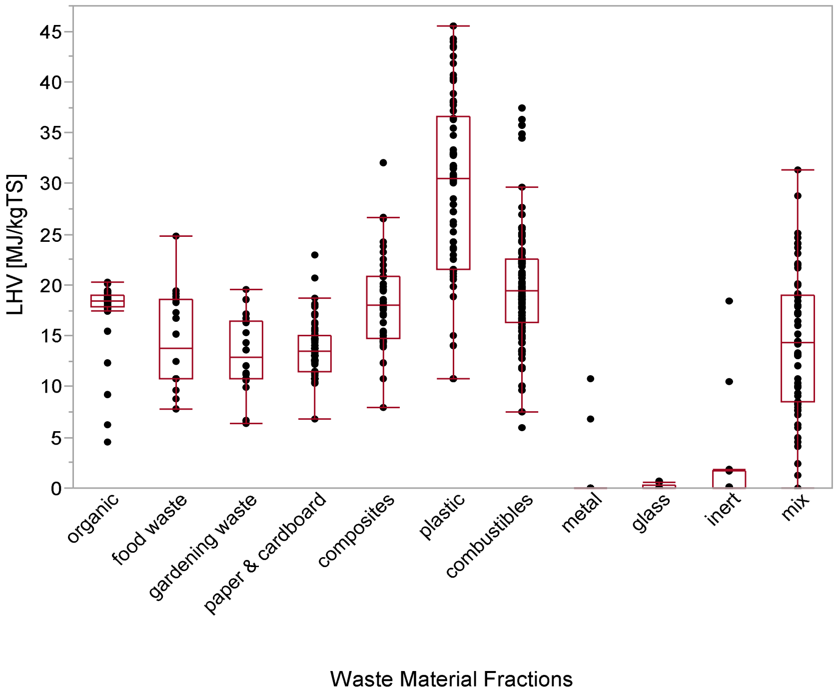
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	76	-	795	8000	9000	10000	14075	18060	21700
food waste	22	-	0	34	4850	8989	12100	25693	41800
gardening waste	26	-	161	216	5677	7695	11960	19900	27300
paper & cardboard	16	-	118	297	676	743	1430	3080	3500
composites	4	-	472	472	497	1096	1980	2100	2100
plastic	7	-	190	190	372	750	1300	1990	1990
combustibles	20	-	278	564	1016	1640	2803	9565	17900
metal	6	-	162	162	191	501	1045	1190	1190
glass	6	-	3650	3650	4237	5730	7195	7750	7750
inert	8	-	2010	2010	6110	12600	16408	18600	18600
mix	70	-	249	1484	2500	3622	7638	12497	19339
Total	261	0							

*) number of data points

**) number of values below the detection limit

Value ranges for LHV



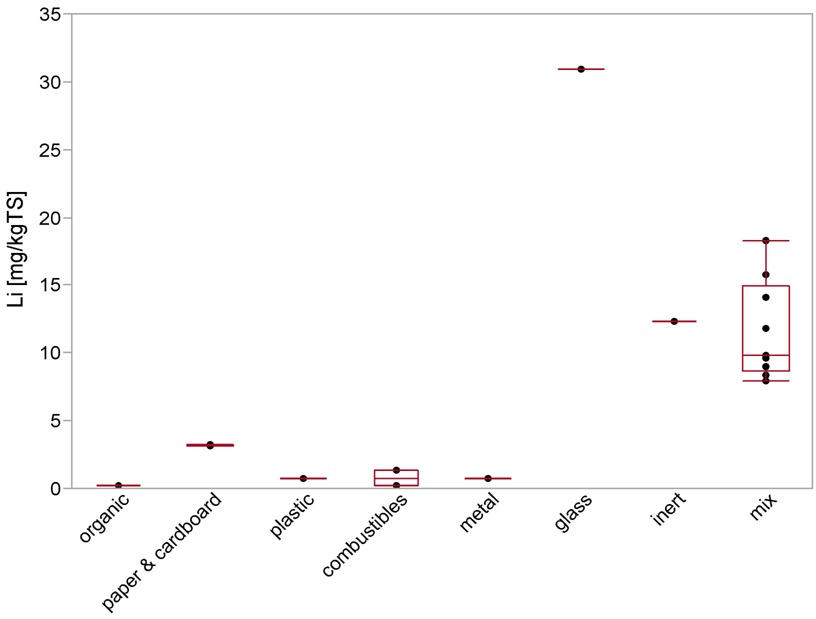
Quantiles [MJ/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	50	-	4.6	15.7	17.9	18.5	18.9	19.4	20.3
food waste	20	-	7.9	8.8	10.8	13.8	18.5	19.4	24.8
gardening waste	20	-	6.4	7.0	10.8	12.8	16.5	18.4	19.5
paper & cardboard	66	-	6.7	10.8	11.5	13.4	15.0	17.3	23.0
composites	39	-	7.9	13.9	14.7	18.0	20.9	24.2	32.1
plastic	74	-	10.8	12.4	21.5	30.5	36.6	42.2	45.5
combustibles	91	-	6.0	13.4	16.3	19.4	22.5	25.7	37.4
metal	11	-	-0.1	-0.1	0.0	0.0	0.0	9.9	10.7
glass	9	-	0.0	0.0	0.0	0.0	0.3	0.7	0.7
inert	12	-	0.0	0.0	0.0	0.0	1.8	16.1	18.5
mix	57	-	0.0	4.9	8.5	14.4	19.0	24.1	31.3
Total	449	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Li



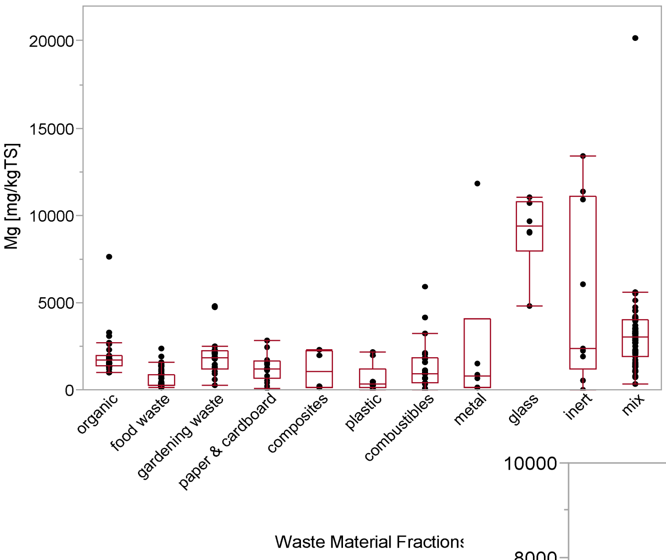
Quantiles [mg/kgTS]

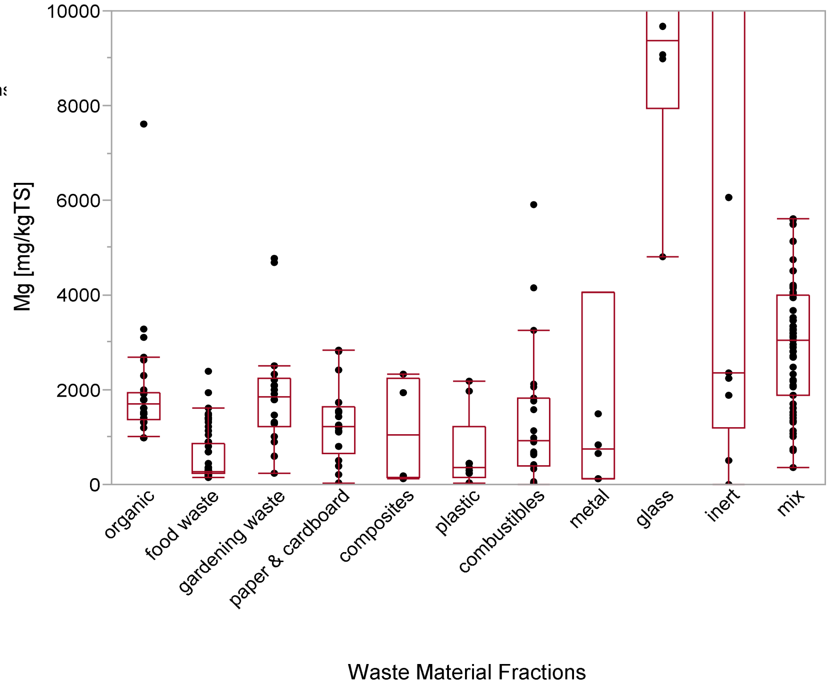
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20
food waste	-	-	-	-	-	-	-	-	-
gardening waste	-	-	-	-	-	-	-	-	-
paper & cardboard	2	-	3.14	3.14	3.14	3.18	3.22	3.22	3.22
composites	-	-	-	-	-	-	-	-	-
plastic	1	-	0.69	0.69	0.69	0.69	0.69	0.69	0.69
combustibles	2	1	0.20	0.20	0.20	0.77	1.33	1.33	1.33
metal	1	1	0.70	0.70	0.70	0.70	0.70	0.70	0.70
glass	1	-	30.90	30.90	30.90	30.90	30.90	30.90	30.90
inert	1	-	12.30	12.30	12.30	12.30	12.30	12.30	12.30
mix	9	-	7.89	7.89	8.70	9.86	14.94	18.31	18.31
Total	18	3							

*) number of data points

**) number of values below the detection limit

Value ranges for Mg





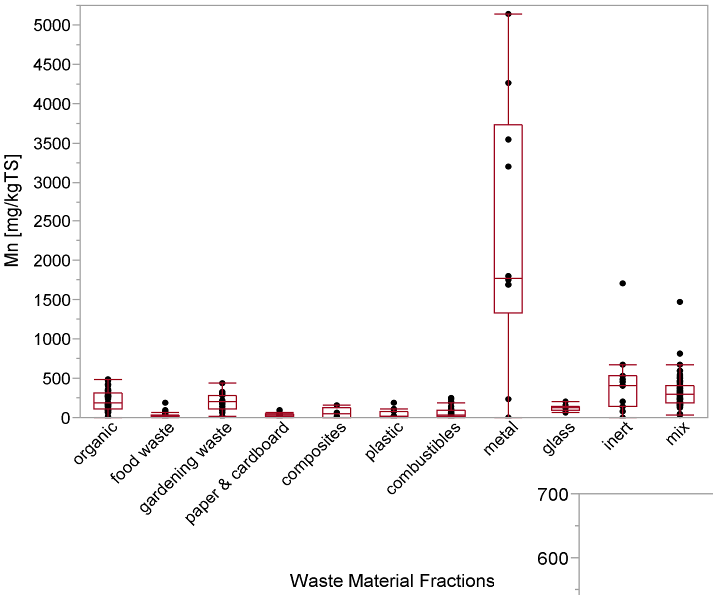
Quantiles [mg/kgTS]

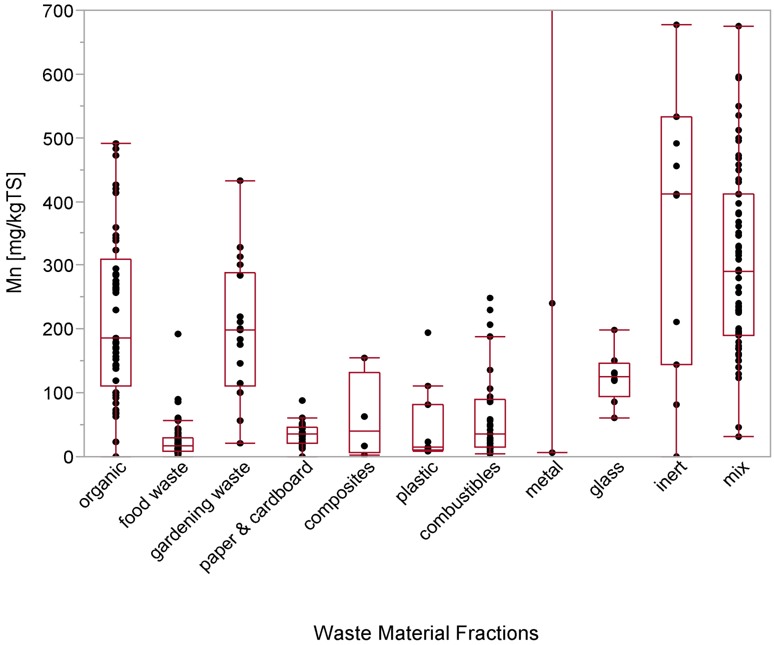
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	30	-	1000	1020	1375	1695	1949	3060	7598
food waste	60	-	136	188	236	274	881	1400	2386
gardening waste	18	-	239	564	1209	1850	2230	4708	4780
paper & cardboard	17	-	43	169	651	1210	1645	2817	2845
composites	4	-	127	127	140	1060	2233	2330	2330
plastic	9	-	19	19	142	344	1213	2170	2170
combustibles	23	-	13	21	375	917	1820	3792	5920
metal	6	-	105	105	119	756	4060	11800	11800
glass	6	-	4800	4800	7949	9370	10780	11020	11020
inert	9	-	0	0	1200	2350	11125	13400	13400
mix	55	-	345	1117	1874	3039	4000	4903	20160
Total	237	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Mn





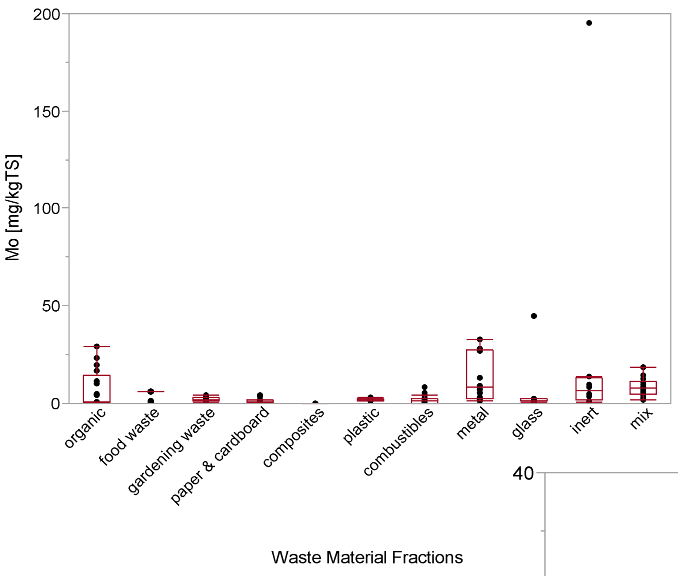
Quantiles [mg/kgTS]

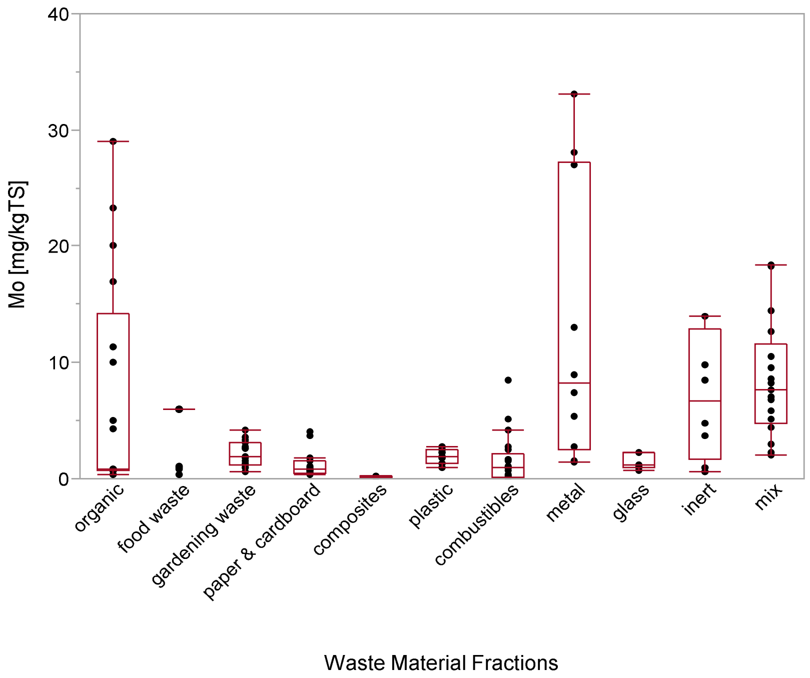
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	45	-	0.0	67.8	110.7	185.5	308.6	422.2	490.6
food waste	58	-	0.0	5.9	9.2	16.5	28.4	56.0	193.0
gardening waste	18	-	21.6	52.6	111.3	198.6	287.9	338.9	433.0
paper & cardboard	22	-	0.0	13.2	20.3	34.7	45.3	58.3	88.2
composites	4	-	2.2	2.2	5.7	39.5	132.0	155.0	155.0
plastic	11	-	7.7	7.7	10.0	14.0	82.0	178.2	195.0
combustibles	31	-	4.8	8.1	15.0	36.0	89.0	202.6	248.0
metal	10	-	6.3	29.7	1327.5	1775.0	3722.5	5053.0	5140.0
glass	8	-	61.0	61.0	93.8	125.5	145.3	199.0	199.0
inert	11	-	0.0	16.4	145.0	412.0	532.0	1503.4	1710.0
mix	68	-	30.9	149.0	190.2	290.2	412.0	536.7	1476.0
Total	163	55							

*) number of data points

**) number of values below the detection limit

Value ranges for Mo





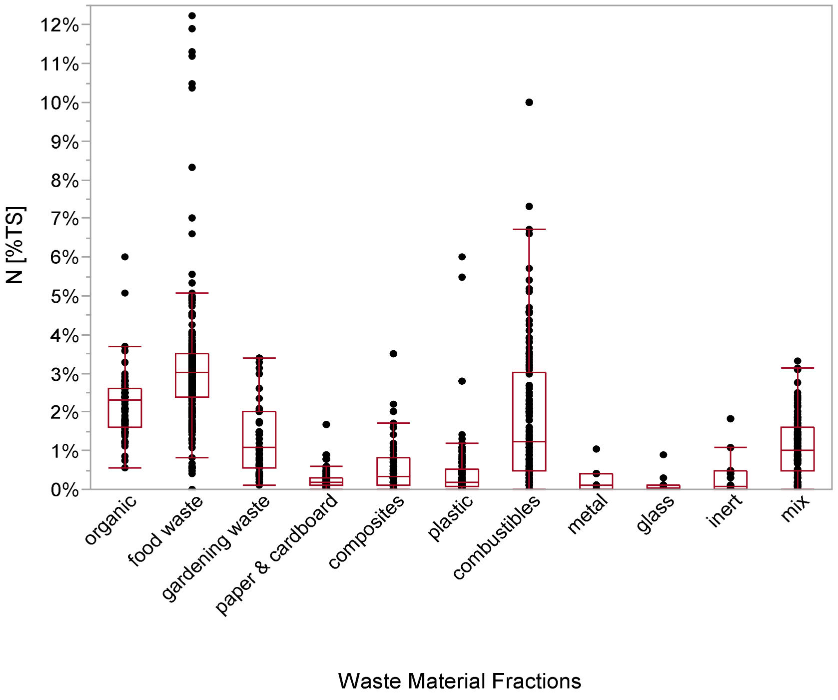
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	17	-	0.34	0.60	0.75	0.81	14.15	24.44	29.00
food waste	44	41	0.30	3.55	6.00	6.00	6.00	6.00	6.00
gardening waste	15	4	0.65	0.86	1.20	1.89	3.06	3.82	4.17
paper & cardboard	15	1	0.32	0.40	0.50	0.79	1.50	3.86	4.10
composites	2	-	0.11	0.11	0.11	0.15	0.19	0.19	0.19
plastic	7	-	0.92	0.92	1.30	1.95	2.50	2.80	2.80
combustibles	21	5	0.12	0.13	0.17	1.00	2.10	4.92	8.50
metal	10	2	1.40	1.42	2.50	8.20	27.25	32.59	33.10
glass	7	1	0.75	0.75	1.00	1.20	2.30	45.00	45.00
inert	8	1	0.54	0.54	1.68	6.67	12.95	195.00	195.00
mix	17	-	2.00	2.18	4.75	7.70	11.61	18.33	18.42
Total	163	55							

*) number of data points

**) number of values below the detection limit

Value ranges for N



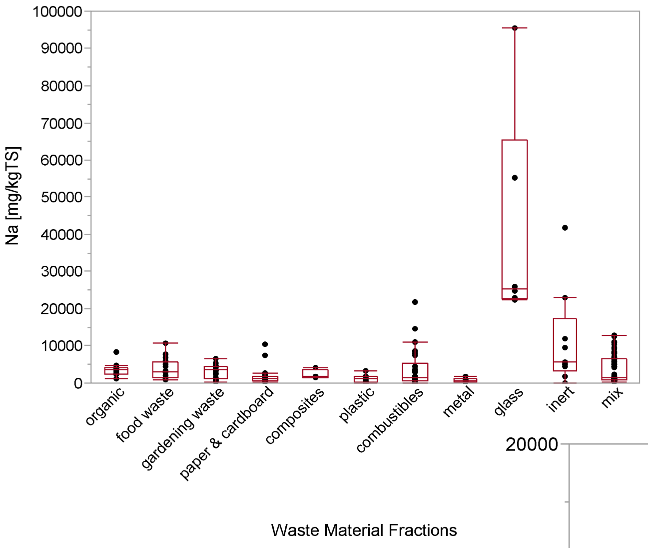
Quantiles [%TS]

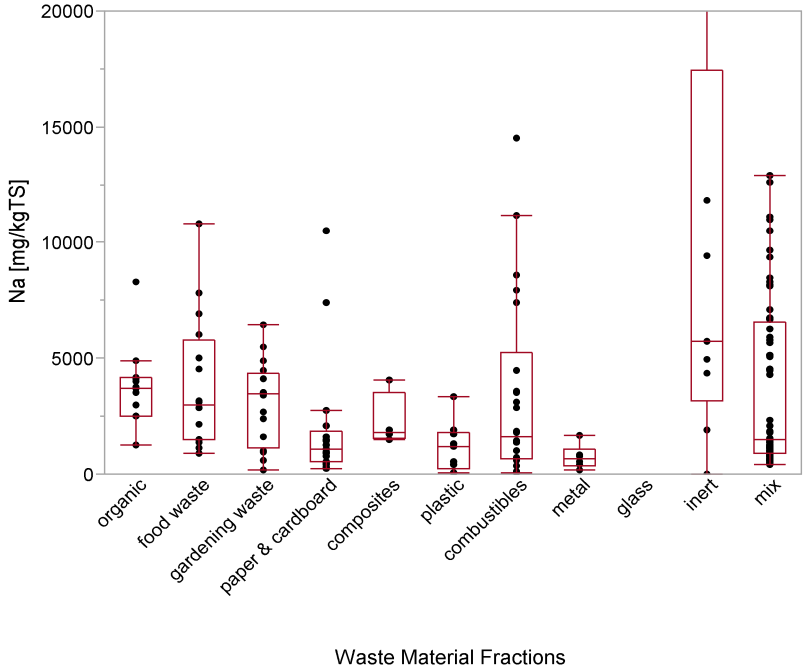
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	104	-	0.56%	1.40%	1.61%	2.30%	2.60%	2.80%	6.00%
food waste	212	-	0.00%	1.59%	2.39%	3.01%	3.50%	4.55%	12.23%
gardening waste	49	-	0.10%	0.33%	0.57%	1.09%	2.00%	3.40%	3.40%
paper & cardboard	114	1	0.00%	0.09%	0.10%	0.20%	0.30%	0.49%	1.69%
composites	42	-	0.00%	0.00%	0.12%	0.35%	0.83%	1.67%	3.50%
plastic	116	1	0.00%	0.00%	0.06%	0.20%	0.53%	1.03%	6.00%
combustibles	146	-	0.00%	0.18%	0.47%	1.22%	3.03%	4.60%	10.00%
metal	13	3	0.00%	0.00%	0.00%	0.10%	0.40%	1.05%	1.05%
glass	13	3	0.00%	0.00%	0.00%	0.04%	0.10%	0.65%	0.88%
inert	14	-	0.00%	0.00%	0.00%	0.08%	0.50%	1.46%	1.81%
mix	117	-	0.00%	0.12%	0.48%	1.05%	1.67%	2.33%	13.16%
Total	940	8							

*) number of data points

**) number of values below the detection limit

Value ranges for Na





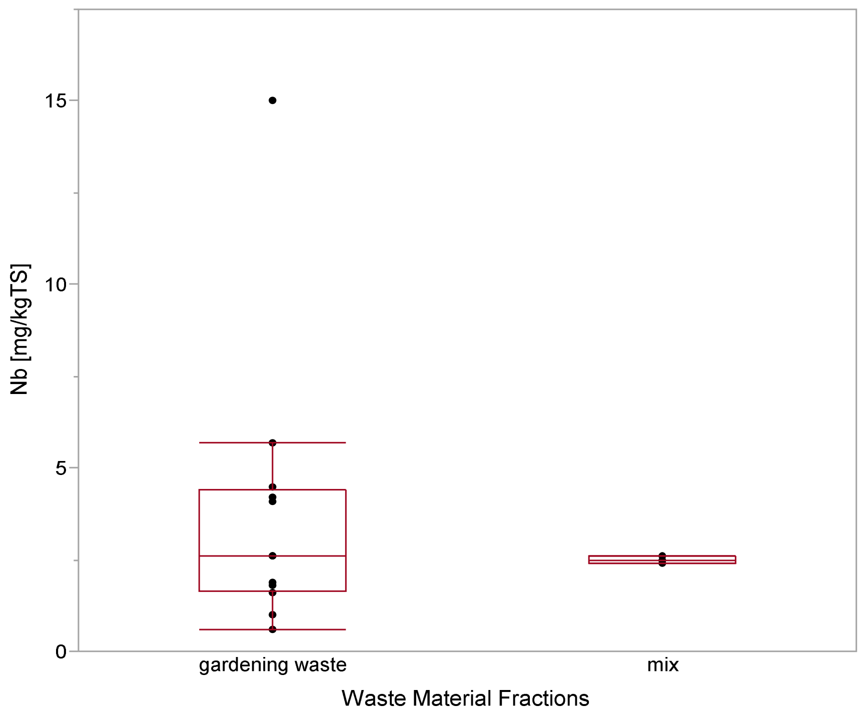
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	13	-	1250	1750	2500	3720	4150	6940	8300
food waste	16	-	877	1058	1483	2980	5767	8729	10800
gardening waste	16	-	168	470	1150	3441	4375	5782	6423
paper & cardboard	17	-	246	272	511	1090	1835	8020	10500
composites	4	-	1500	1500	1560	1820	3520	4060	4060
plastic	9	-	36	36	250	1170	1810	3340	3340
combustibles	26	-	39	52	671	1630	5225	12162	21900
metal	6	-	165	165	334	648	1054	1670	1670
glass	6	-	22400	22400	22820	25500	65343	95500	95500
inert	9	-	0	0	3135	5760	17411	41700	41700
mix	64	-	437	605	890	1502	6580	9534	12876
Total	186	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Nb



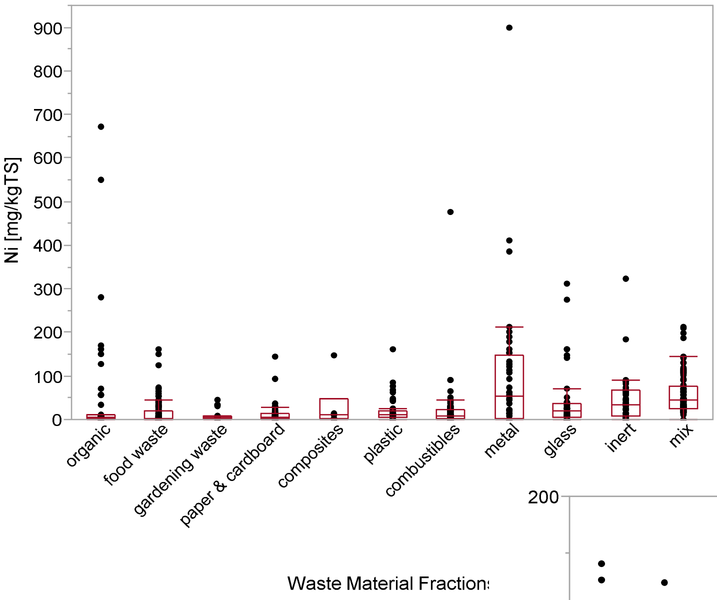
Quantiles [mg/kgTS]

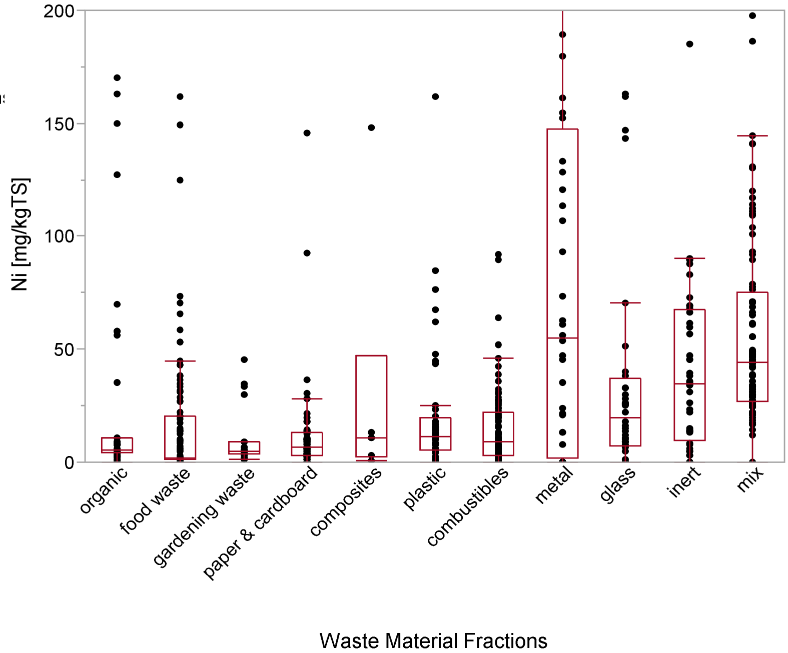
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	-	-	-	-	-	-	-	-	-
food waste	-	-	-	-	-	-	-	-	-
gardening waste	12	11	0.600	0.720	1.650	2.600	4.425	12.210	15.000
paper & cardboard	-	-	-	-	-	-	-	-	-
composites	-	-	-	-	-	-	-	-	-
plastic	-	-	-	-	-	-	-	-	-
combustibles	-	-	-	-	-	-	-	-	-
metal	-	-	-	-	-	-	-	-	-
glass	-	-	-	-	-	-	-	-	-
inert	-	-	-	-	-	-	-	-	-
mix	3	-	2.400	2.400	2.400	2.500	2.600	2.600	2.600
Total	15	11							

*) number of data points

**) number of values below the detection limit

Value ranges for Ni





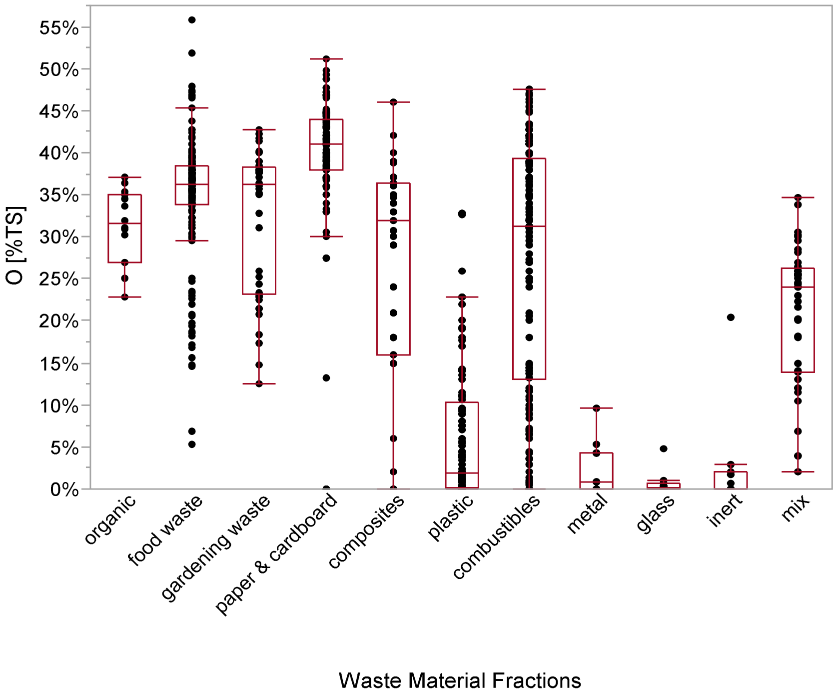
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	51	-	0.0	2.3	3.9	5.6	10.5	160.4	673.0
food waste	99	24	0.0	1.0	1.0	2.0	20.4	44.9	162.0
gardening waste	20	-	1.0	1.6	3.5	4.8	9.0	34.6	45.6
paper & cardboard	57	2	0.0	0.9	3.2	6.5	13.3	28.0	145.6
composites	6	-	0.5	0.5	2.2	10.8	47.1	148.3	148.3
plastic	44	-	0.0	0.2	5.4	11.6	19.6	64.9	161.8
combustibles	97	-	0.0	0.0	3.2	8.8	22.0	33.2	476.0
metal	40	-	0.0	0.0	2.0	55.0	147.3	211.4	900.0
glass	40	-	0.0	0.0	6.9	19.9	37.1	160.5	313.0
inert	44	-	0.0	1.6	9.3	34.7	67.7	89.3	322.0
mix	104	-	0.0	20.5	26.8	44.2	75.2	118.5	211.3
Total	602	26							

*) number of data points

**) number of values below the detection limit

Value ranges for O



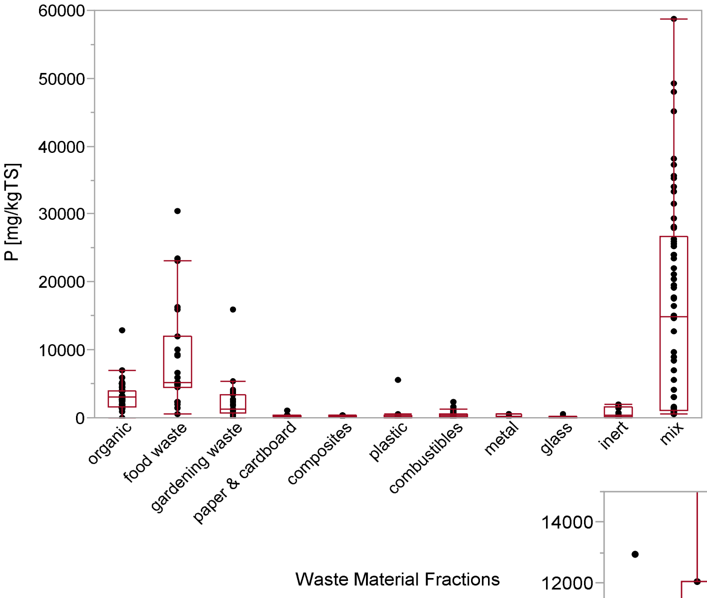
Quantiles [%TS]

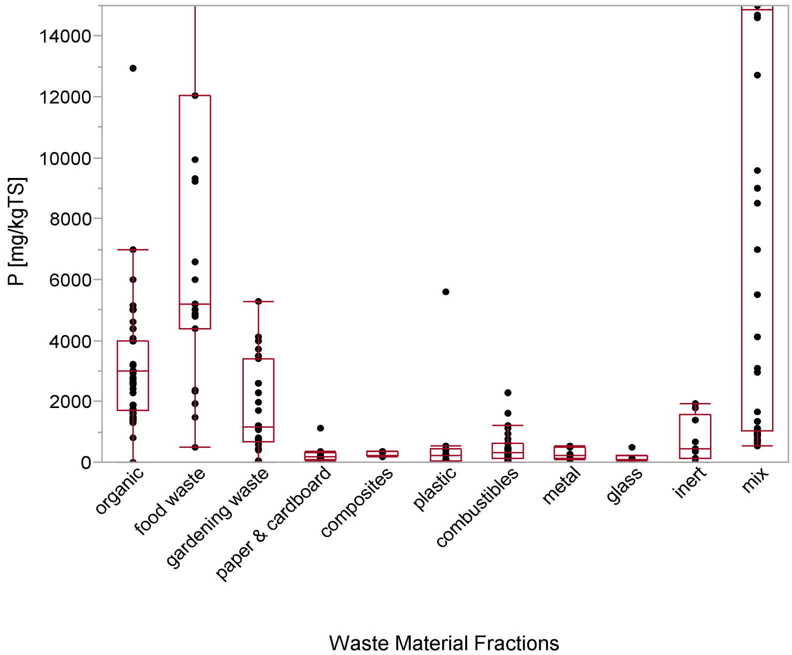
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	14	-	22.9%	24.0%	26.9%	31.5%	35.1%	36.7%	37.0%
food waste	173	-	5.3%	23.1%	33.8%	36.2%	38.5%	40.7%	55.8%
gardening waste	40	-	12.6%	18.6%	23.1%	36.2%	38.2%	41.2%	42.7%
paper & cardboard	112	-	0.0%	32.9%	38.0%	41.1%	44.0%	46.8%	51.2%
composites	39	-	0.0%	0.0%	16.0%	32.0%	36.4%	40.0%	46.0%
plastic	112	-	0.0%	0.0%	0.2%	1.9%	10.3%	19.1%	32.8%
combustibles	130	-	0.0%	3.7%	13.0%	31.3%	39.2%	42.7%	47.6%
metal	13	-	0.0%	0.0%	0.0%	0.8%	4.3%	7.9%	9.6%
glass	12	-	0.0%	0.0%	0.0%	0.2%	0.6%	3.7%	4.8%
inert	11	-	0.0%	0.0%	0.0%	0.0%	2.0%	17.0%	20.5%
mix	43	-	2.0%	5.1%	13.8%	24.0%	26.3%	30.2%	34.6%
Total	699	0							

*) number of data points

**) number of values below the detection limit

Value ranges for P





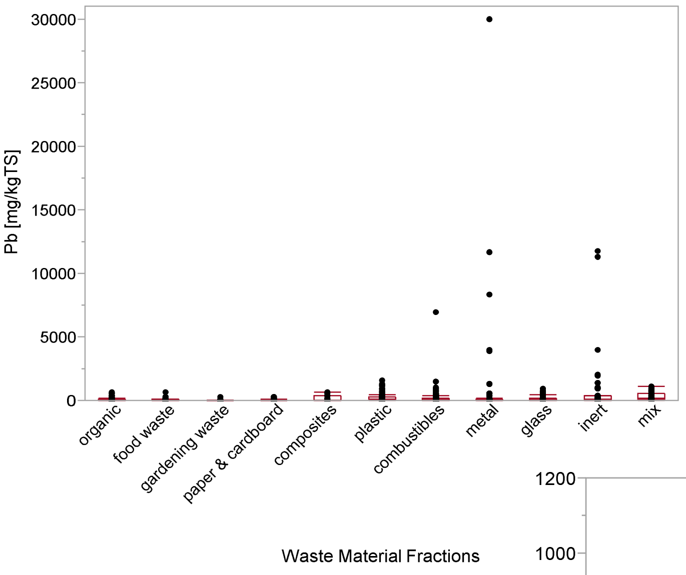
Quantiles [mg/kgTS]

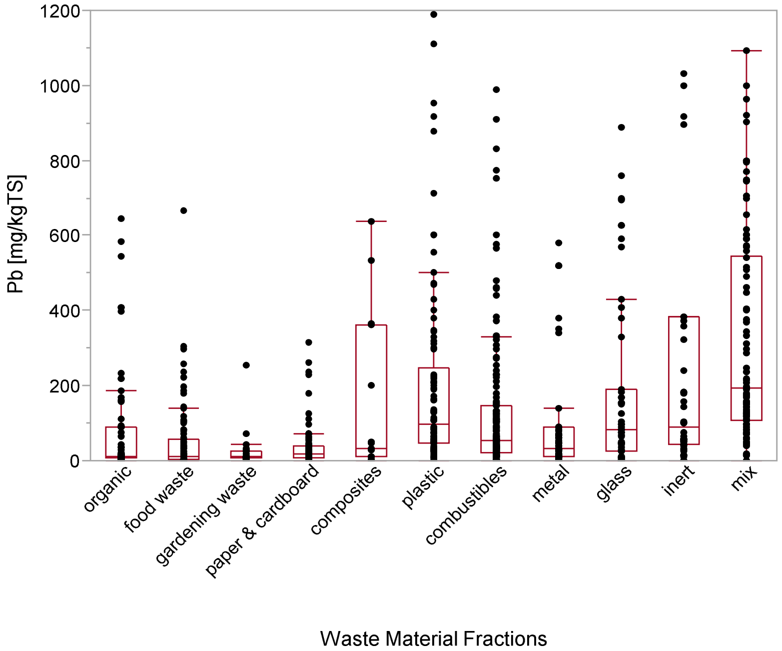
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	85	-	5	1438	1700	3000	4000	5000	12950
food waste	23	-	489	1659	4400	5200	12045	23386	30455
gardening waste	27	-	21	28	666	1184	3400	4340	15900
paper & cardboard	18	-	38	43	109	164	291	422	1100
composites	4	-	189	189	224	340	373	380	380
plastic	10	-	15	16	63	244	445	5104	5610
combustibles	27	-	13	30	148	300	608	1294	2300
metal	6	-	110	110	139	232	498	551	551
glass	6	1	64	64	70	98	212	480	480
inert	9	-	0	0	141	439	1585	1920	1920
mix	62	-	550	736	1051	14850	26725	36750	58800
Total	277	1							

*) number of data points

**) number of values below the detection limit

Value ranges for Pb





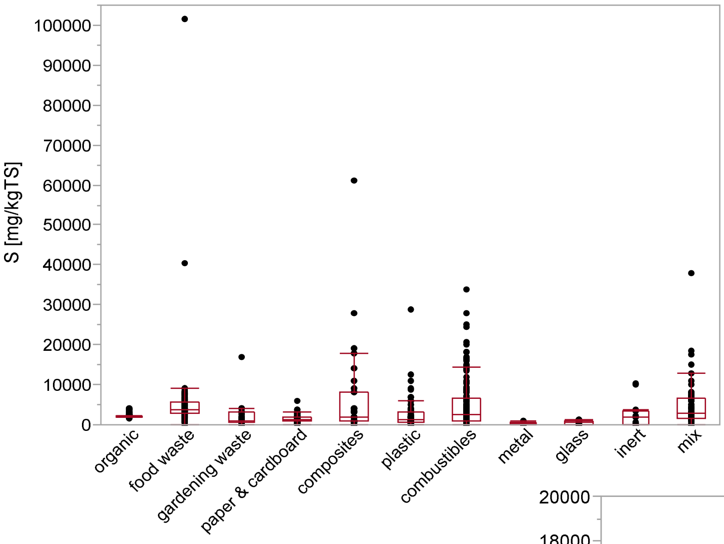
Quantiles [mg/kgTS]

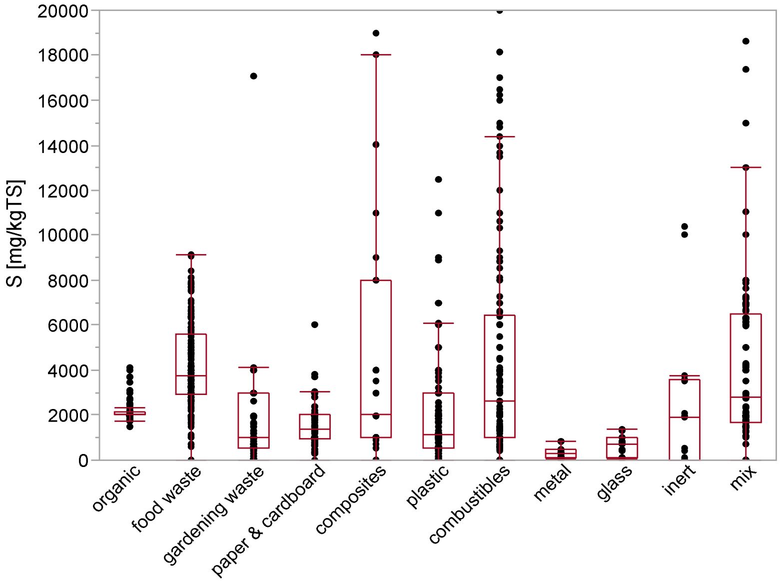
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	68	-	0.0	3.4	6.7	10.7	89.1	250.3	643.2
food waste	105	40	0.0	2.0	2.0	11.0	56.9	157.6	666.9
gardening waste	25	-	0.0	2.0	6.7	9.6	23.7	54.8	255.3
paper & cardboard	88	2	0.0	2.7	7.6	17.4	39.8	74.4	316.0
composites	15	-	0.7	1.0	9.0	34.0	363.3	575.2	638.0
plastic	102	-	0.8	21.9	46.6	98.2	247.0	602.0	1595.0
combustibles	155	3	0.0	9.1	23.0	53.8	147.0	405.2	6900.0
metal	67	1	0.0	0.0	9.0	33.0	90.0	1283.2	30010.0
glass	51	-	0.0	0.0	24.6	81.5	189.1	628.0	889.0
inert	50	-	0.0	13.1	41.3	88.4	382.3	1910.5	11740.0
mix	102	3	0.0	47.4	107.1	191.9	544.6	764.0	1092.1
Total	828	49							

*) number of data points

**) number of values below the detection limit

Value ranges for S





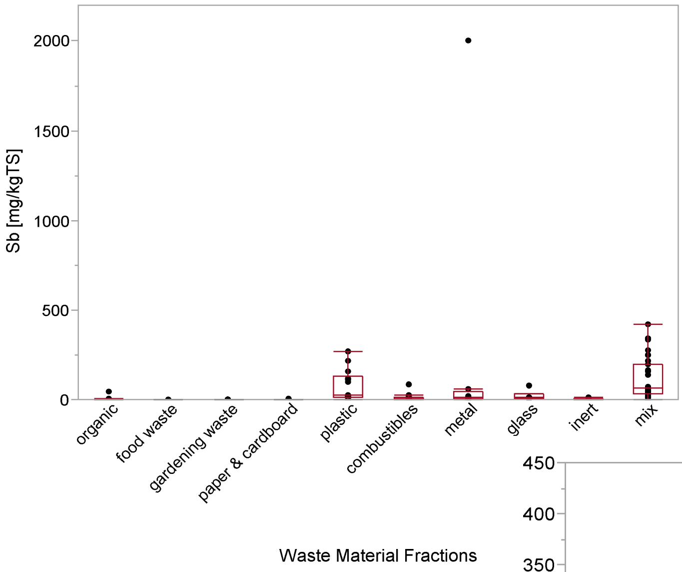
Quantiles [mg/kgTS]

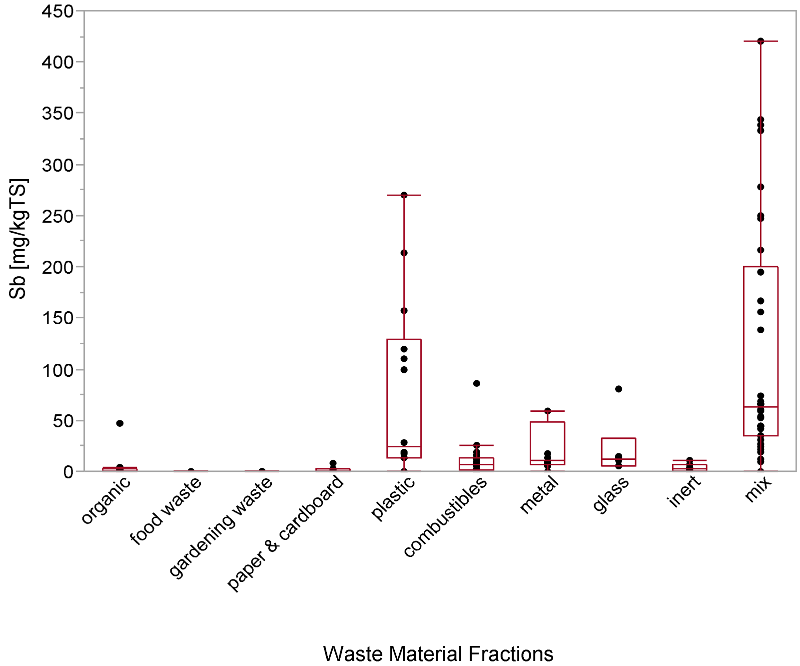
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	67	-	1500	1888	2000	2000	2170	3020	4100
food waste	175	-	0	1960	2900	3780	5600	7510	101700
gardening waste	39	-	0	51	557	1000	3000	4000	17065
paper & cardboard	81	-	0	526	944	1400	2000	3000	6000
composites	37	-	0	0	1000	2000	8000	18200	61000
plastic	101	2	0	0	520	1125	3000	6000	28740
combustibles	142	3	0	587	1000	2600	6428	14654	34000
metal	13	2	30	30	95	297	500	808	808
glass	11	-	50	58	111	687	1000	1383	1400
inert	15	-	0	0	0	1920	3590	10164	10410
mix	85	-	0	419	1694	2800	6490	8006	38000
Total	766	7							

*) number of data points

**) number of values below the detection limit

Value ranges for Sb





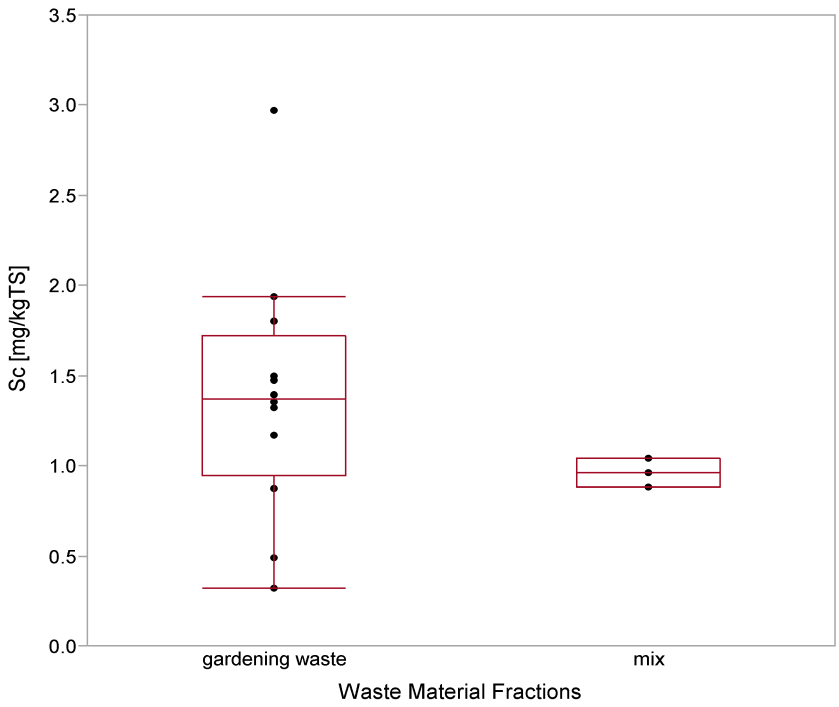
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	12	5	0.02	0.16	0.50	0.60	2.60	34.04	47.00
food waste	2	1	0.00	0.00	0.00	0.25	0.50	0.50	0.50
gardening waste	13	4	0.00	0.00	0.00	0.04	0.11	0.18	0.20
paper & cardboard	8	2	0.00	0.00	0.20	0.56	2.45	7.90	7.90
composites	-	-	-	-	-	-	-	-	-
plastic	14	-	0.00	0.00	12.88	24.00	129.23	242.18	270.60
combustibles	23	-	0.00	0.00	0.90	6.20	13.00	22.68	86.30
metal	8	1	0.50	0.50	6.45	11.40	48.73	2000.00	2000.00
glass	6	-	5.90	5.90	5.98	12.28	31.70	81.20	81.20
inert	7	1	0.00	0.00	0.50	2.70	6.07	11.10	11.10
mix	34	-	0.00	15.16	34.28	62.90	200.10	336.00	420.00
Total	127	14							

*) number of data points

**) number of values below the detection limit

Value ranges for Sc



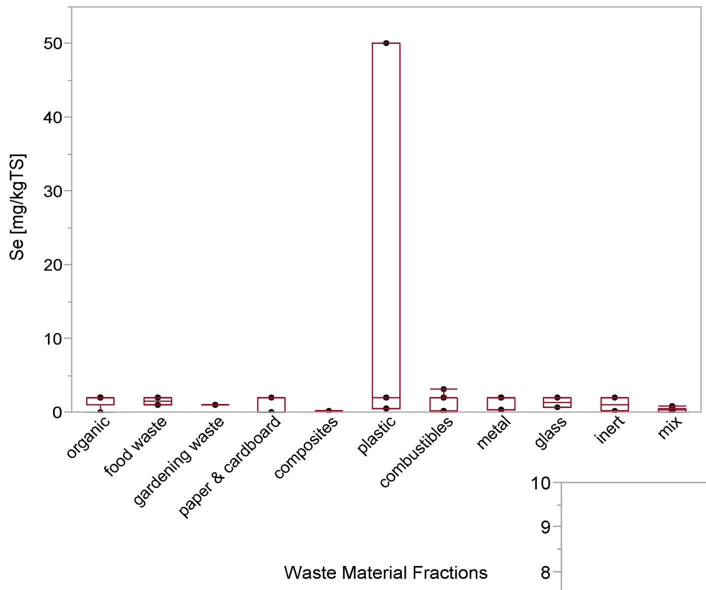
Quantiles [mg/kgTS]

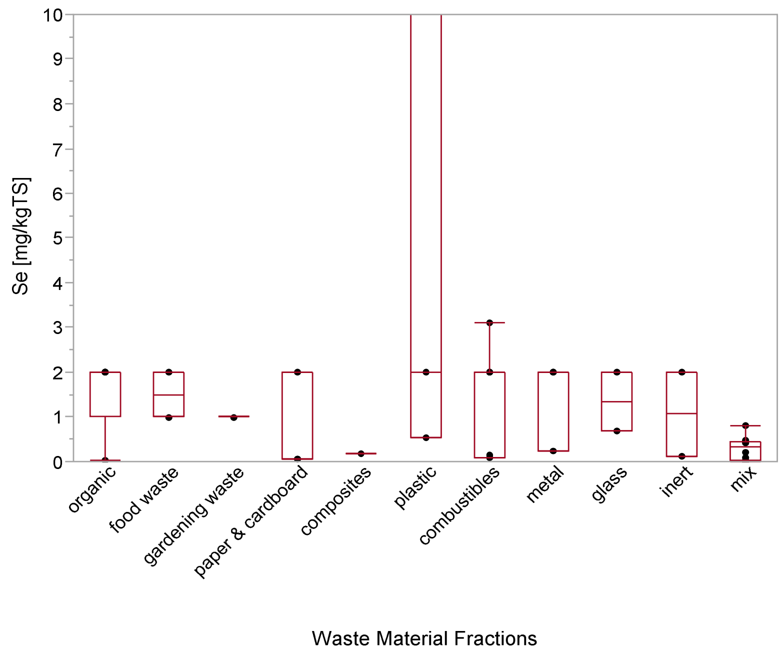
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	-	-	-	-	-	-	-	-	-
food waste	-	-	-	-	-	-	-	-	-
gardening waste	12		0.32	0.37	0.95	1.37	1.73	2.66	2.97
paper & cardboard	-	-	-	-	-	-	-	-	-
composites	-	-	-	-	-	-	-	-	-
plastic	-	-	-	-	-	-	-	-	-
combustibles	-	-	-	-	-	-	-	-	-
metal	-	-	-	-	-	-	-	-	-
glass	-	-	-	-	-	-	-	-	-
inert	-	-	-	-	-	-	-	-	-
mix	3		0.88	0.88	0.88	0.96	1.04	1.04	1.04
Total	15	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Se





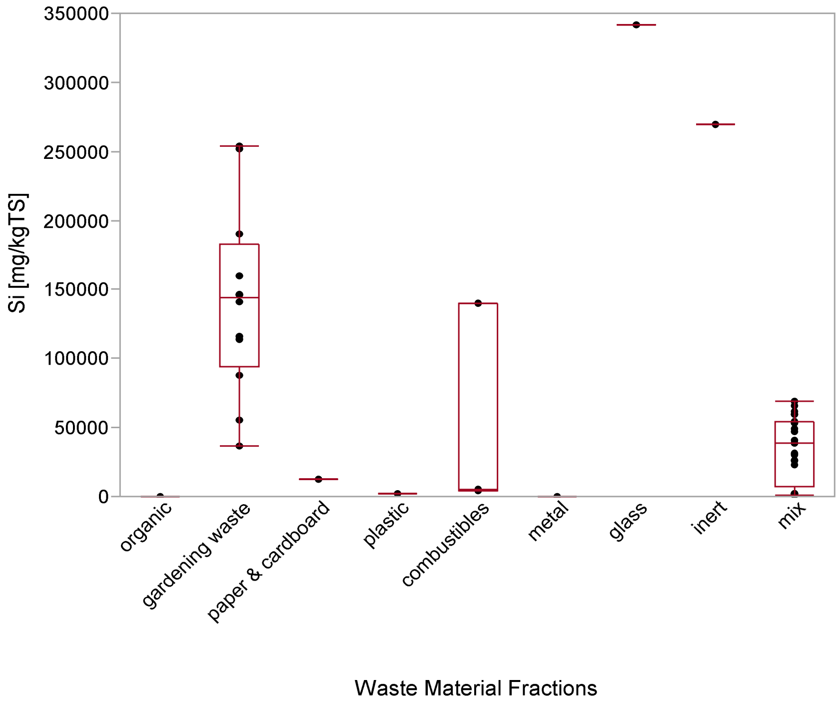
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	5	4	0.04	0.04	1.02	2.00	2.00	2.00	2.00
food waste	2	2	1.00	1.00	1.00	1.50	2.00	2.00	2.00
gardening waste	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00
paper & cardboard	3	1	0.06	0.06	0.06	0.07	2.00	2.00	2.00
composites	1	-	0.17	0.17	0.17	0.17	0.17	0.17	0.17
plastic	3	2	0.55	0.55	0.55	2.00	50.00	50.00	50.00
combustibles	7	3	0.08	0.08	0.10	2.00	2.00	3.10	3.10
metal	3	2	0.25	0.25	0.25	2.00	2.00	2.00	2.00
glass	2	1	0.69	0.69	0.69	1.35	2.00	2.00	2.00
inert	2	1	0.12	0.12	0.12	1.06	2.00	2.00	2.00
mix	10	-	0.00	0.00	0.02	0.32	0.46	0.77	0.80
Total	39	17							

*) number of data points

**) number of values below the detection limit

Value ranges for Si



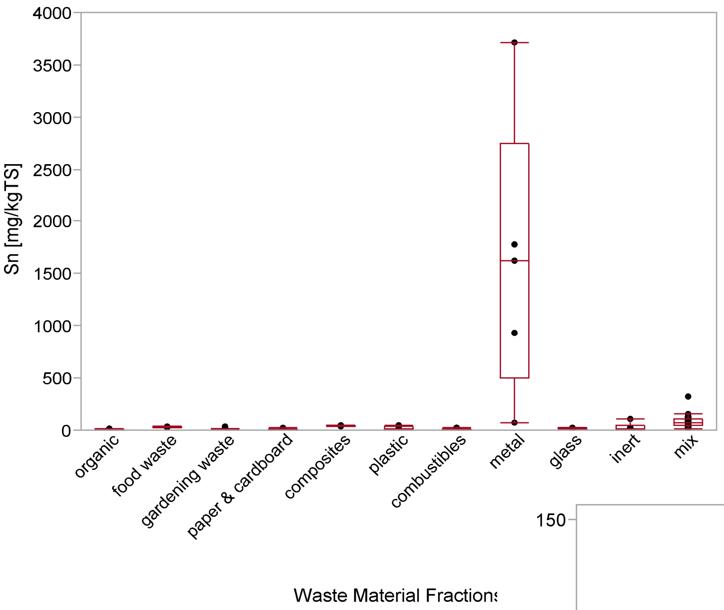
Quantiles [mg/kgTS]

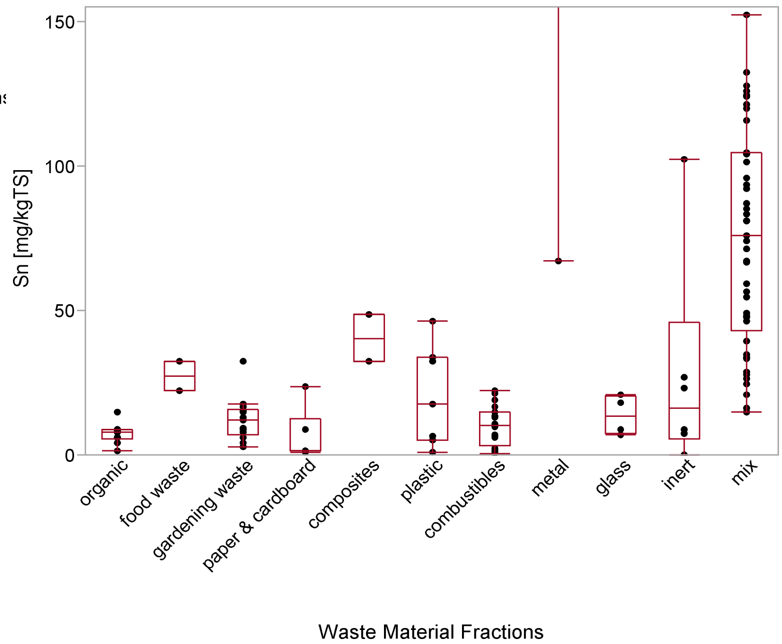
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	-	488	488	488	488	488	488	488
food waste	-	-	-	-	-	-	-	-	-
gardening waste	12	-	37000	42400	94283	143733	182500	253663	254393
paper & cardboard	2	-	12200	12200	12200	12400	12600	12600	12600
composites	-	-	-	-	-	-	-	-	-
plastic	1	-	1670	1670	1670	1670	1670	1670	1670
combustibles	3	-	3980	3980	3980	5110	140000	140000	140000
metal	1	-	168	168	168	168	168	168	168
glass	1	-	342000	342000	342000	342000	342000	342000	342000
inert	1	-	270000	270000	270000	270000	270000	270000	270000
mix	24	-	1447	1700	7443	38579	54480	64099	69200
Total	46	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Sn





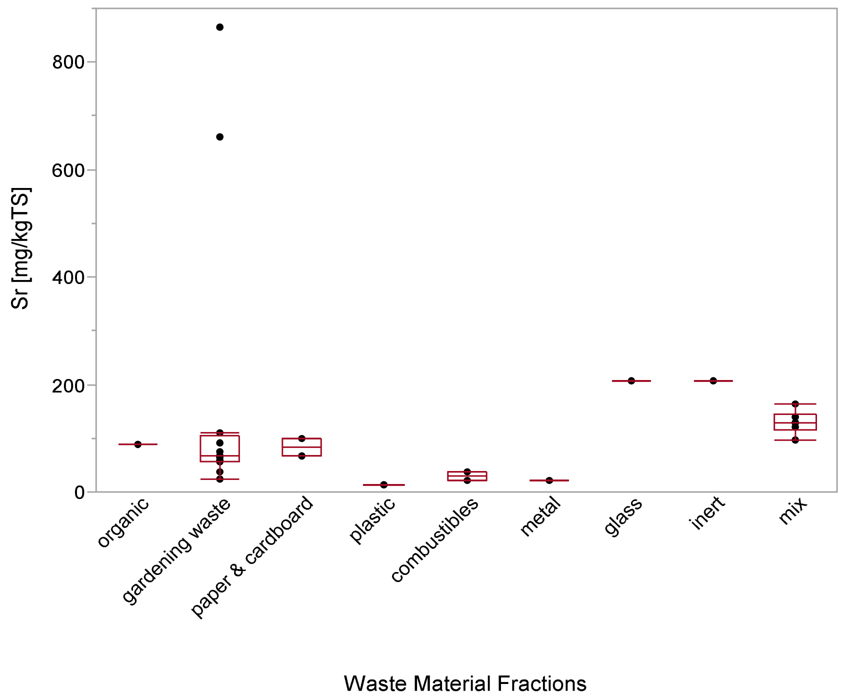
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	10	-	1.2	1.5	5.6	8.0	8.9	14.1	14.7
food waste	2	-	22.0	22.0	22.0	27.3	32.5	32.5	32.5
gardening waste	13	4	3.0	3.4	7.1	12.0	15.9	26.4	32.2
paper & cardboard	6	1	1.0	1.0	1.2	1.4	12.6	23.5	23.5
composites	2	-	32.3	32.3	32.3	40.4	48.5	48.5	48.5
plastic	7	1	0.9	0.9	5.0	17.7	34.0	46.4	46.4
combustibles	20	2	0.6	1.0	3.4	10.3	14.7	21.2	22.4
metal	5	1	67.0	67.0	498.5	1620.0	2745.0	3710.0	3710.0
glass	4	-	7.1	7.1	7.5	13.5	20.3	21.0	21.0
inert	6	-	0.0	0.0	5.6	16.0	45.9	102.4	102.4
mix	45	-	15.0	25.6	42.9	76.1	104.4	126.5	321.0
Total	120	9							

*) number of data points

**) number of values below the detection limit

Value ranges for Sr



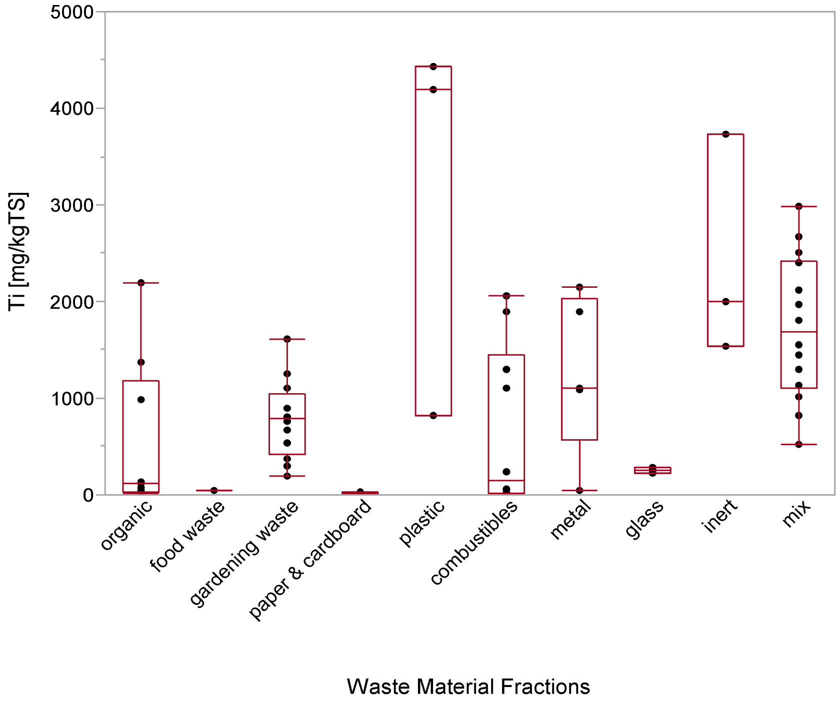
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	1	-	88.1	88.1	88.1	88.1	88.1	88.1	88.1
food waste	-	-	-	-	-	-	-	-	-
gardening waste	12	-	25.0	28.6	56.9	67.6	104.9	803.1	864.0
paper & cardboard	2	-	68.5	68.5	68.5	83.5	98.4	98.4	98.4
composites	-	-	-	-	-	-	-	-	-
plastic	1	-	13.3	13.3	13.3	13.3	13.3	13.3	13.3
combustibles	2	-	20.9	20.9	20.9	29.0	37.0	37.0	37.0
metal	1	-	21.5	21.5	21.5	21.5	21.5	21.5	21.5
glass	1	-	208.0	208.0	208.0	208.0	208.0	208.0	208.0
inert	1	-	208.0	208.0	208.0	208.0	208.0	208.0	208.0
mix	6	-	97.0	97.0	115.0	130.0	145.0	163.0	163.0
Total	27	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Ti



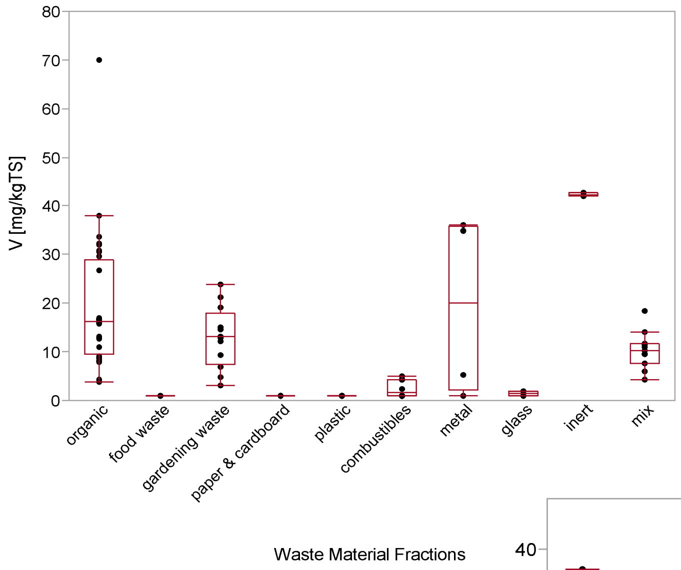
Quantiles [mg/kgTS]

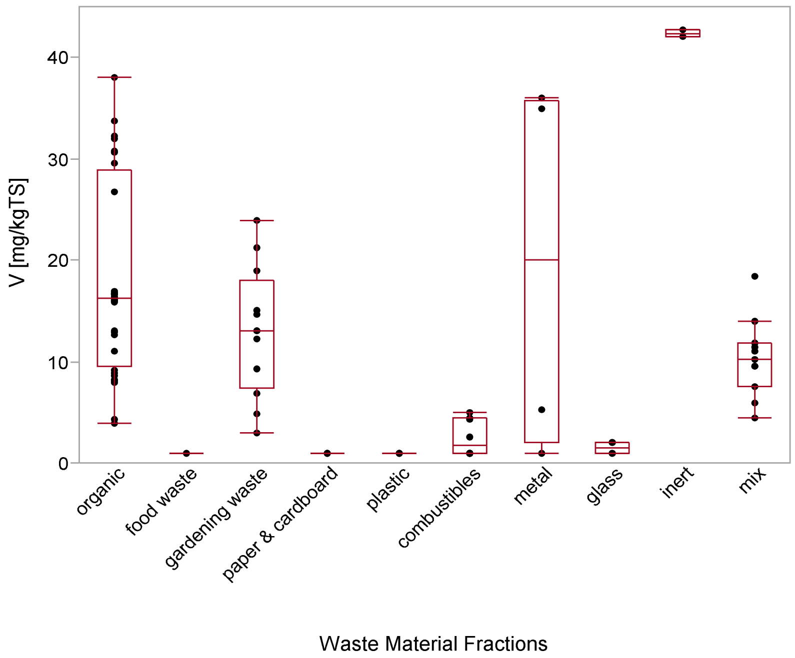
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	9	-	8	8	34	120	1175	2200	2200
food waste	1	-	45	45	45	45	45	45	45
gardening waste	12	-	200	230	413	788	1050	1502	1607
paper & cardboard	4	-	10	10	10	13	30	34	34
composites	-	-	-	-	-	-	-	-	-
plastic	3	-	821	821	821	4200	4433	4433	4433
combustibles	10	-	8	8	13	150	1450	2050	2067
metal	5	-	46	46	568	1100	2025	2150	2150
glass	3	-	230	230	230	250	289	289	289
inert	3	-	1533	1533	1533	2000	3730	3730	3730
mix	14	-	529	673	1101	1680	2425	2833	2990
Total	64	0							

*) number of data points

**) number of values below the detection limit

Value ranges for V





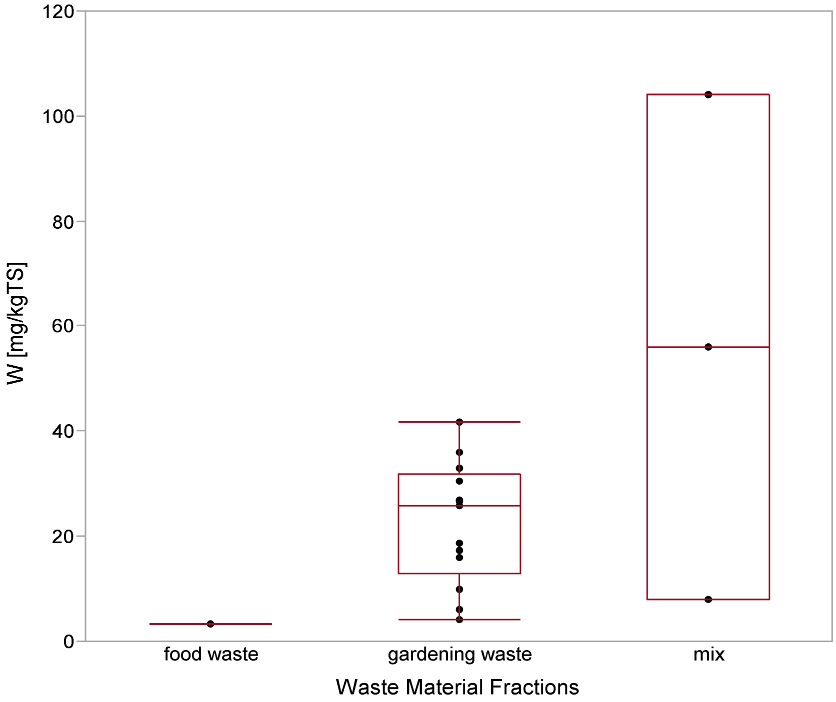
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	32		3.90	7.92	9.57	16.22	28.86	33.23	70.00
food waste	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00
gardening waste	12		3.00	3.54	7.44	13.03	18.00	23.08	23.85
paper & cardboard	2	2	1.00	1.00	1.00	1.00	1.00	1.00	1.00
plastic	2	2	1.00	1.00	1.00	1.00	1.00	1.00	1.00
combustibles	8	4	1.00	1.00	1.00	1.75	4.38	5.00	5.00
metal	4	1	1.00	1.00	2.05	20.05	35.73	36.00	36.00
glass	2	1	1.00	1.00	1.00	1.50	2.00	2.00	2.00
inert	2		42.00	42.00	42.00	42.35	42.70	42.70	42.70
mix	11		4.39	4.69	7.58	10.20	11.80	17.52	18.40
Total	76	11							

*) number of data points

**) number of values below the detection limit

Value ranges for W



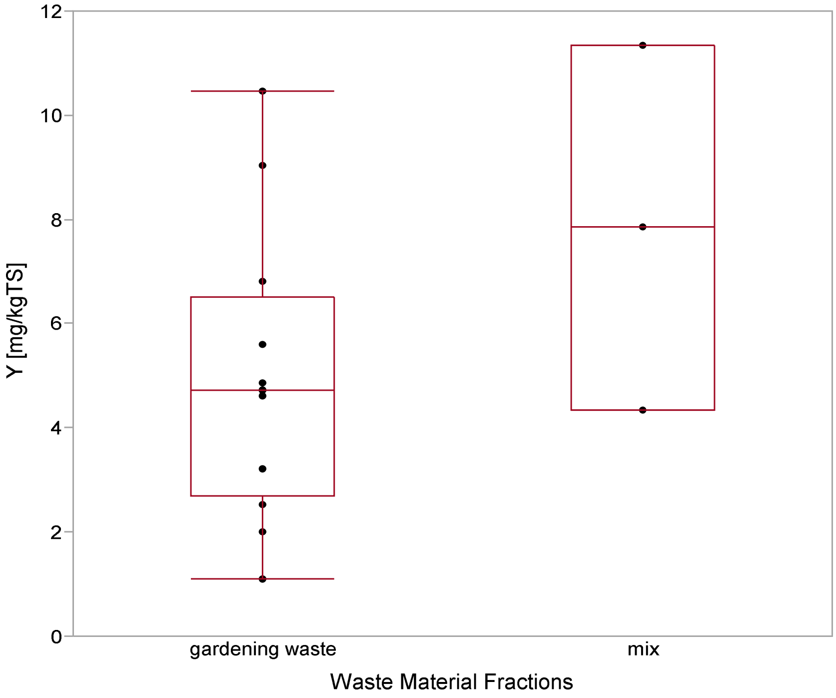
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	-	-	-	-	-	-	-	-	-
food waste	1	-	3.3	3.3	3.3	3.3	3.3	3.3	3.3
gardening waste	13	4	4.0	4.8	13.0	25.7	31.8	39.4	41.7
paper & cardboard	-	-	-	-	-	-	-	-	-
composites	-	-	-	-	-	-	-	-	-
plastic	-	-	-	-	-	-	-	-	-
combustibles	-	-	-	-	-	-	-	-	-
metal	-	-	-	-	-	-	-	-	-
glass	-	-	-	-	-	-	-	-	-
inert	-	-	-	-	-	-	-	-	-
mix	3	-	8.0	8.0	8.0	56.0	104.0	104.0	104.0
Total	17	4							

*) number of data points

**) number of values below the detection limit

Value ranges for Y



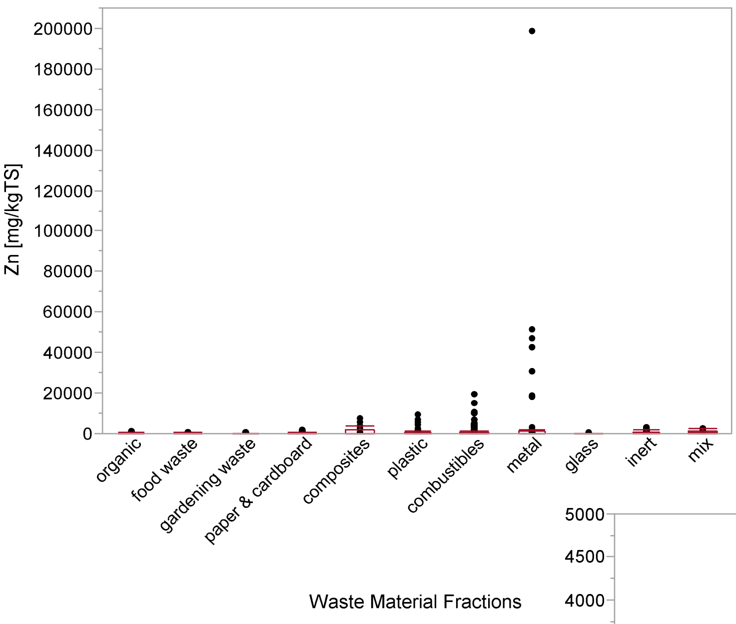
Quantiles [mg/kgTS]

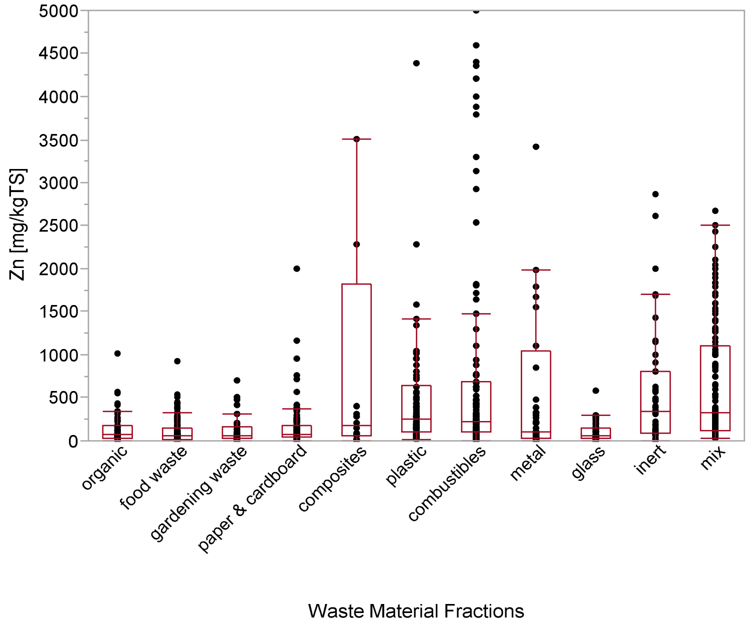
Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	-	-	-	-	-	-	-	-	-
food waste	-	-	-	-	-	-	-	-	-
gardening waste	12	-	1.1	1.4	2.7	4.7	6.5	10.0	10.5
paper & cardboard	-	-	-	-	-	-	-	-	-
composites	-	-	-	-	-	-	-	-	-
plastic	-	-	-	-	-	-	-	-	-
combustibles	-	-	-	-	-	-	-	-	-
metal	-	-	-	-	-	-	-	-	-
glass	-	-	-	-	-	-	-	-	-
inert	-	-	-	-	-	-	-	-	-
mix	3	-	4.4	4.4	4.4	7.9	11.4	11.4	11.4
Total	15	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Zn





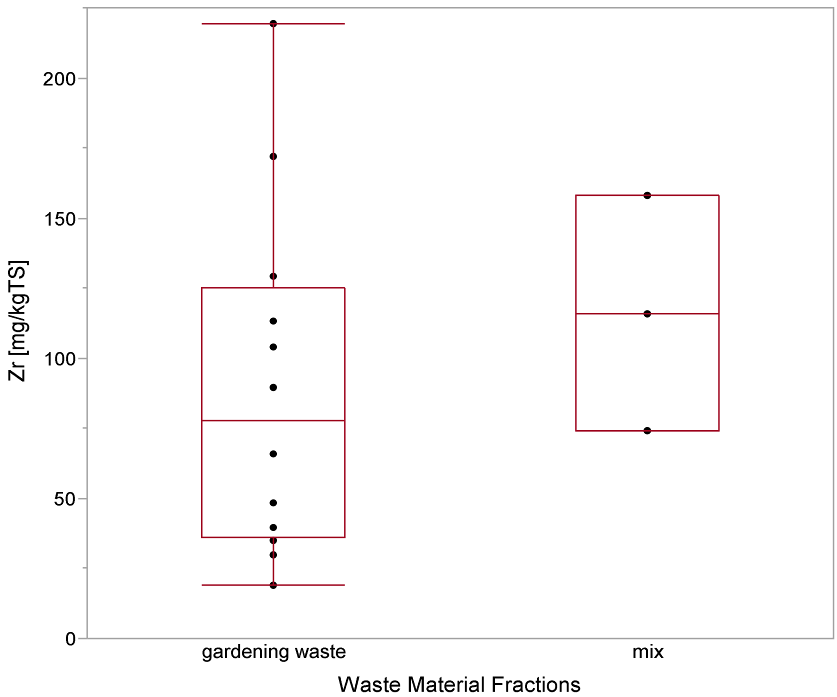
Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	63	-	0.0	28.3	35.7	75.0	182.0	346.0	1010.0
food waste	123	-	0.0	7.5	12.1	56.0	144.6	295.8	931.4
gardening waste	30	-	0.0	0.7	26.8	64.0	168.3	469.6	696.3
paper & cardboard	88	-	0.0	25.3	38.2	77.7	175.5	380.4	1997.0
composites	16	-	3.7	9.0	66.1	176.0	1815.7	6153.9	7577.0
plastic	82	-	14.3	43.5	107.1	258.7	647.3	1246.9	9204.0
combustibles	133	-	0.0	40.8	101.2	230.0	719.5	4121.2	19475.0
metal	64	-	0.0	0.0	28.3	103.5	1045.0	30446.0	199000.0
glass	44	-	0.0	0.0	26.3	54.5	155.6	277.6	575.9
inert	44	-	0.0	28.5	88.0	343.0	807.1	1693.2	2862.2
mix	131	-	23.3	70.8	126.3	323.8	1100.0	1704.4	2677.0
Total	818	0							

*) number of data points

**) number of values below the detection limit

Value ranges for Zr



Quantiles [mg/kgTS]

Waste Material Fraction	n_data*	n_<DL**	Min	10%	25%	Median	75%	90%	Max
organic	-	-	-	-	-	-	-	-	-
food waste	-	-	-	-	-	-	-	-	-
gardening waste	12	-	19	22	36	78	125	205	219
paper & cardboard	-	-	-	-	-	-	-	-	-
composites	-	-	-	-	-	-	-	-	-
plastic	-	-	-	-	-	-	-	-	-
combustibles	-	-	-	-	-	-	-	-	-
metal	-	-	-	-	-	-	-	-	-
glass	-	-	-	-	-	-	-	-	-
inert	-	-	-	-	-	-	-	-	-
mix	3	-	74	74	74	116	158	158	158
Total	15	0							

*) number of data points

**) number of values below the detection limit